Evaluation of Quality Assurance/Quality Control Data Collected by the U.S. Geological Survey for Water-Quality Activities at the Idaho National Engineering Laboratory, Idaho, 1989 through 1993

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U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 96-4148

Prepared in cooperation with the
U.S. DEPARTMENT OF ENERGY

Idaho Falls, Idaho
June 1996

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Abstract

Hundreds of water samples were collected by the U.S. Geological Survey (USGS) from 177 monitoring sites for the water-quality monitoring program at the Idaho National Engineering Laboratory from 1989 through 1993. Concurrently, replicate pairs of samples and various types of blank samples were collected as part of the quality assurance/quality control program. Analyses were performed to determine the concentrations of major ions, nutrients, trace elements, gross radioactivity and radionuclides, organic compounds, and total organic carbon in the samples.

To evaluate the precision of field and laboratory methods, analytical results of the replicate pairs of samples were compared statistically for equivalence on the basis of the precision associated with each result. Ninety percent or more of the analytical results for each constituent were equivalent, except for ammonia plus organic nitrogen, orthophosphate, iron, manganese, radium-226, total organic carbon, and total phenols.

Blank-sample analytical results indicated that the inorganic-free blank water from the USGS Quality of Water Service Unit and the deionized water from the USGS Idaho Falls Field Office were suitable source solutions for blanks. Waters from other sources were found to be unsatisfactory as blank source solutions. Results of the analyses of several equipment blanks were evaluated to determine if a bias had been introduced and the possible sources of the bias. All of the equipment-blank analytical results indicated that ammonia concentrations were greater than the reporting level. None of the equipment blanks had measurable concentrations of radioactivity. Eight percent of the analyses for inorganic constituents showed measurable concentrations were present in the blanks, nine percent for radioactive constituents, and less than one percent for organic constituents.

INTRODUCTION

The Idaho National Engineering Laboratory (INEL) includes approximately 890 mi^2 of the eastern Snake River Plain in southeastern Idaho (fig. 1). The INEL was established in 1949 as the National Reactor Testing Station for nuclear-reactor research. Today, the U.S. Department of Energy (DOE) continues the reactor research along with numerous other projects, including defense programs, and environmental and waste remediation and research. Through the years, these activities have produced aqueous radioactive and chemical wastes that have been disharged into ponds and wells. Prior to 1984, most of the aqueous radioactive and chemical wastes generated at the INEL were injected directly into the Snake River Plain aquifer through deep wells. Since 1984, most of the aqueous

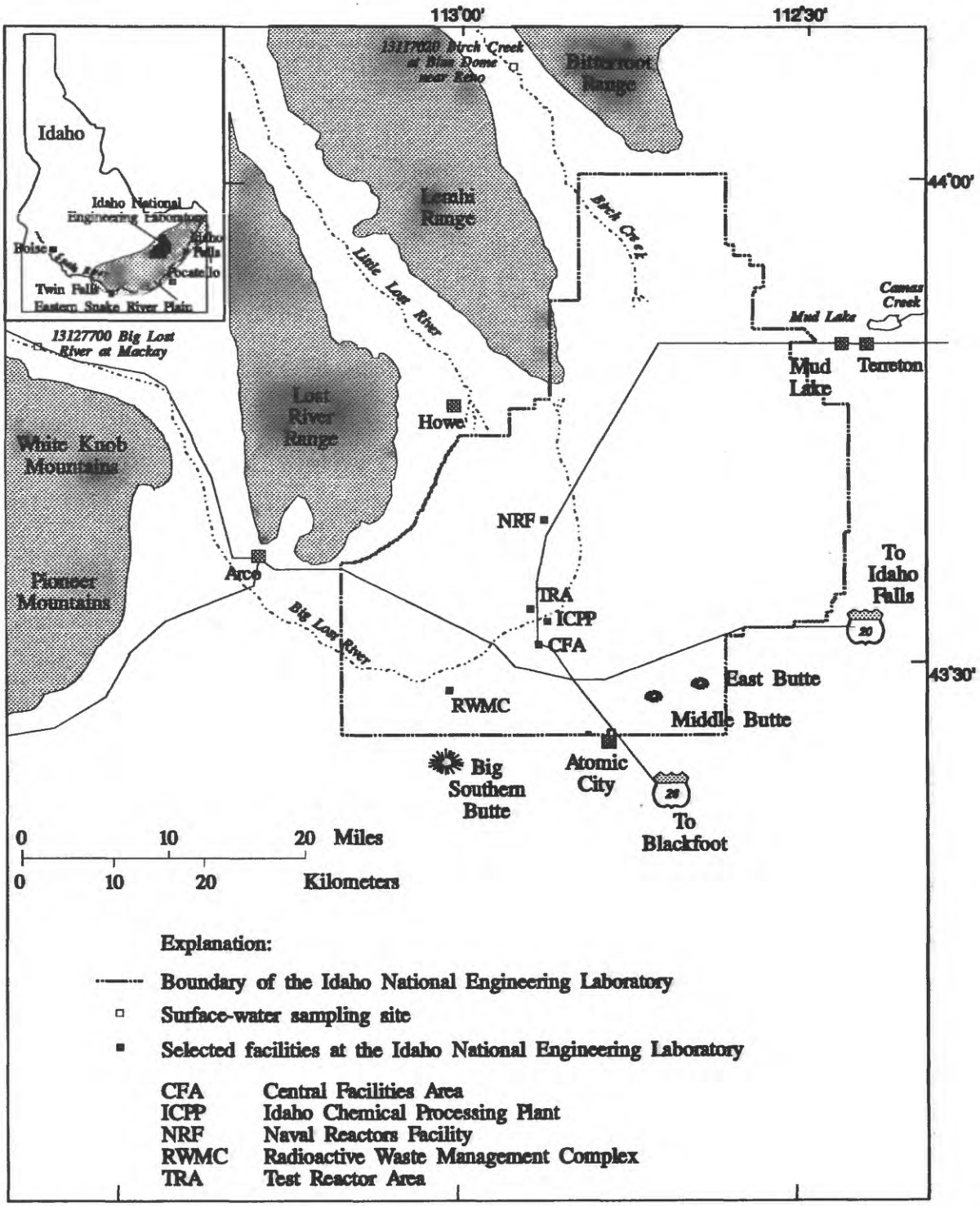


Figure 1. Locations of the Idaho National Engineering Laboratory, facilities, and surface-water sites sampled for the quality assurance/quality control program, Idaho National Engineering Laboratory, 1989 through 1993.

wastes have been discharged to unlined infiltration ponds. Many of the waste constituents have entered the aquifer after percolation through the unsaturated zone. The U.S. Geological Survey (USGS) conducts an extensive, ongoing water-quality monitoring program at 177 ground- and surface-water sites at the INEL in cooperation with the DOE. This program monitors effects of the waste disposal on the Snake River Plain aquifer. The information is provided to and used by many Federal and State government agencies and the general public.

Purpose and Scope

The purpose of this report is to present an evaluation of the data from the quality assurance/quality control (QA/QC) efforts of the water-quality monitoring program conducted by the USGS at the INEL from 1989 through 1993. Thousands of analytical results of replicate pairs are reported and compared for statistical equivalence. The replicate-pair analytical data and the results of the comparisons are compiled and tabulated along with the source-solution blank and equipment-blank analytical data. Evaluation of the results of the replicate pairs and the blank samples helps to assess precision and bias both in the field and in the laboratory. This not only validates the methods and procedures used at the INEL Project Office, but also allows for planning future QA/QC efforts.

Included in the report is a brief description of the methods and procedures used by field personnel for collection of replicate pairs of samples and preparation of blank samples. Locations of sampling sites and site identifiers are shown on figures 1–3. The laboratories involved in the project were the USGS National Water Quality Laboratory (NWQL) in Arvada, Colo., and the DOE Radiological and Environmental Sciences Laboratory (RESL) at the INEL. The laboratories and their respective analyses are listed in table 1. The inorganic constituent analyses included major ions, nutrients, and trace elements. The gross radioactivity and radionuclide analyses included gross alpha radioactivity, gross beta radioactivity, gamma radiation, radium-226, radium-228, strontium-90, tritium, and transuranics. Analyses of organic constituents included total organic carbon, volatile organic compounds, semivolatile organic compounds, pesticides, gross polychlorinated compounds, Aroclors, and total phenols.

Acknowledgments

The author thanks employees of the USGS at the INEL Project Office and at the NWQL and the employees of DOE at the RESL who collected and analyzed the water samples described in this report. The author is especially grateful for the technical reviews by L.L. Knobel, M.A. Hardy, and E.J. Gilroy, all of the USGS.

QUALITY ASSURANCE/QUALITY CONTROL PRACTICES

The USGS is committed to collecting water samples that are as representative of the sampling site as possible and to reporting reliable and reproducible data. Guidelines that are specific to the USGS activities at the INEL have been set forth in the Quality Assurance Plan and Field Methods for Quality of Water Activities (L.J. Mann, USGS, written commun., 1989). This comprehensive plan defines the required procedures and tasks performed to ensure the reliability of water-quality data. It is available for inspection at the INEL Project Office. This plan is updated continually and a brief description of the tasks and procedures is included in this report.

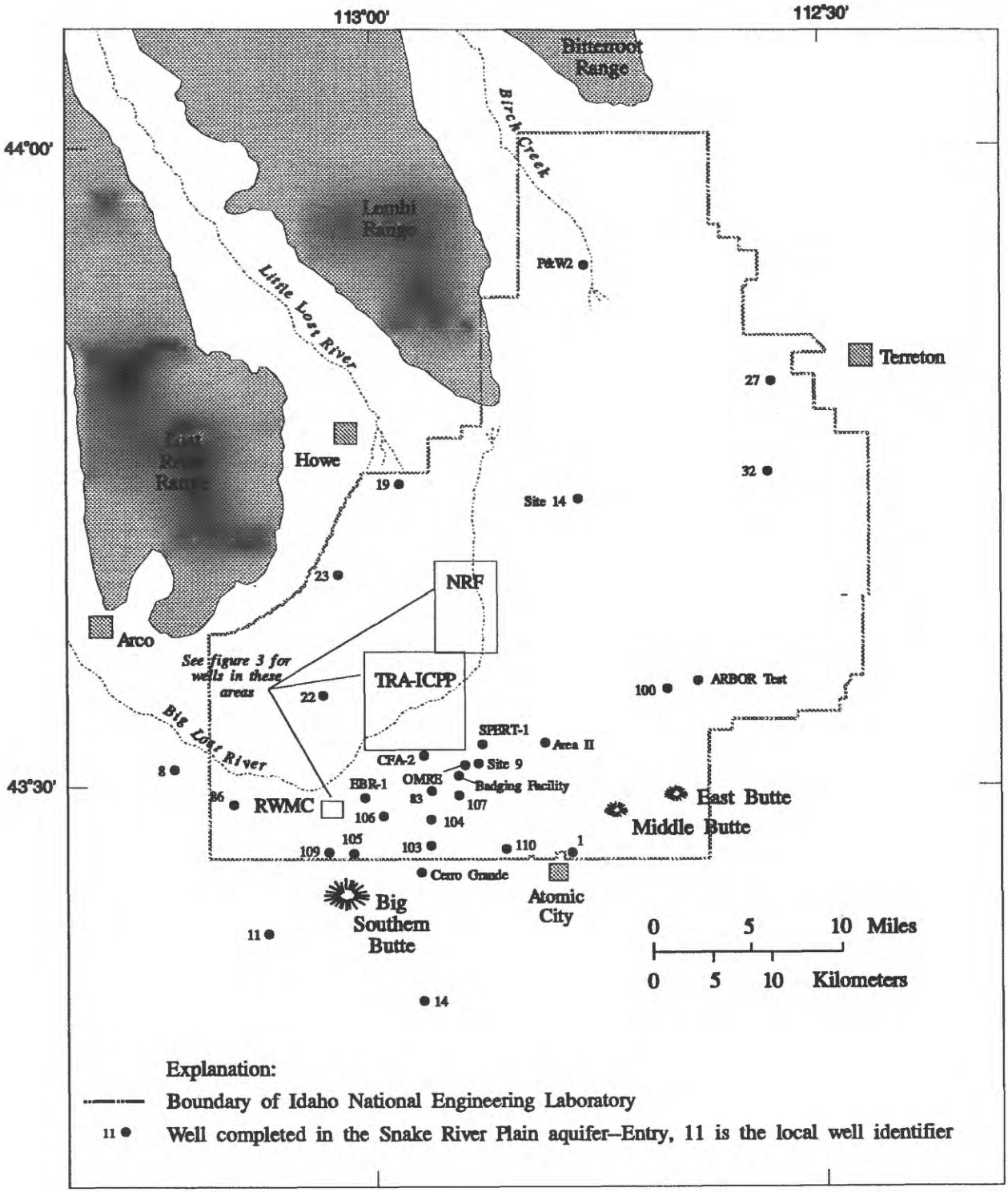


Figure 2. Locations of wells sampled for the quality assurance/quality control program, Idaho National Engineering Laboratory, 1989 through 1993

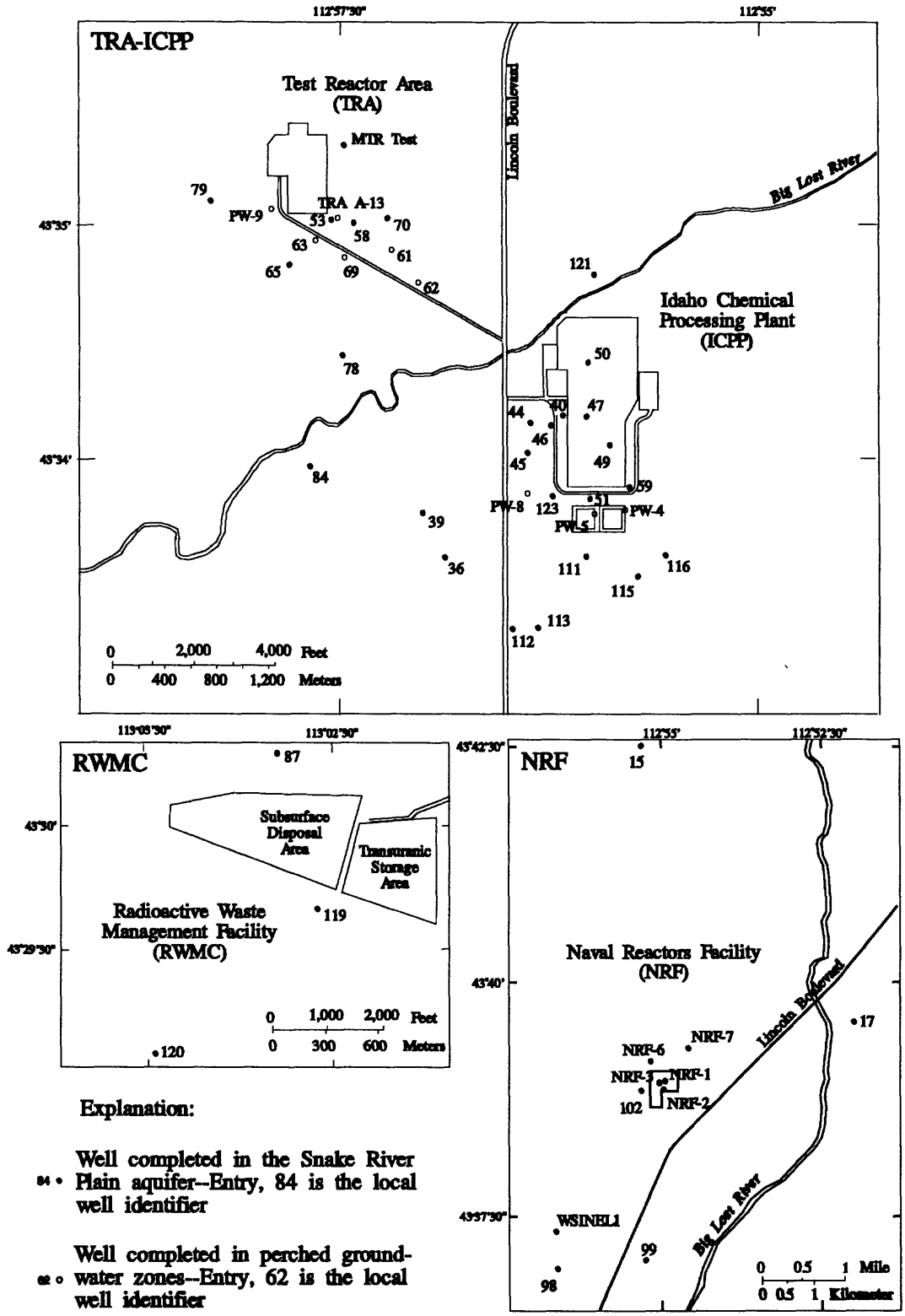


Figure 3. Locations of wells at the Test Reactor Area, Idaho Chemical Processing Plant, Radioactive Waste Management Complex, and Naval Reactors Facility sampled for the quality assurance/quality control program, Idaho National Engineering Laboratory, 1989 through 1993

Table 1. Laboratories and respective analyses performed for the water-quality monitoring program at the Idaho National Engineering Laboratory

Laboratory	Quantitative analyses performed
National Water Quality Laboratory	Inorganic constituents: major ions (sodium, sulfate, chloride, fluoride, and bromide); nutrients (nitrite, nitrite plus nitrate, ammonia, ammonia plus organic nitrogen, and orthophosphate); trace elements (aluminum, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, silver, and zinc)
	Gross radioactivity and radionuclides: gross alpha, gross beta, radium-226, radium-228, and tritium
	Organic constituents: total organic carbon, volatile organic compounds, semivolatile organic compounds, pesticides, gross polychlorinated compounds, Aroclors, and total phenols
Radiological and Environmental Sciences Laboratory	Inorganic constituents: major ions (sodium and chloride); trace element (chromium)
	Gross radioactivity and radionuclides: gross alpha, gross beta, gamma radiation, strontium-90, tritium, americium-241, plutonium-238, and plutonium-239/240

Field personnel also take part in the National Field Quality Assurance Tests administered annually by the USGS (Erdmann and Thomas, 1985, p. 110–115). These tests are used to evaluate performance in making field measurements for pH, specific conductivity, and alkalinity.

The part of the QA/QC program, from 1989 through 1993, that consisted of sending replicate pairs of samples and blank samples to the laboratories for analysis of specific constituents is described in this report. Analytical results for the replicate pairs were compared for statistical equivalence. The analytical results of the replicate pairs of samples and the statistical comparisons are presented in tables 10–52 in the Supplemental Information Section at the end of this report. The blank-sample results were evaluated and the data are presented in tables 53–61 in the same section.

Sample Containers and Preservatives

Sample containers and preservatives were supplied by the NWQL in accordance with the laboratory requirements specified by the NWQL Services Catalog (Pritt and Jones, 1989; A.C. Watterson and A.T. Kashuba, USGS, written commun., 1993). The laboratory's Quality Assurance/Quality Control Manual (Pritt and Raese, 1992) establishes the policies to ensure that the containers are free of contamination. The NWQL receives the required containers from suppliers, tests for contamination, and cleans the containers according to written procedures. Sample preservatives, which are prepared by contract suppliers for the NWQL, also are tested according to written procedures prior to shipping to field personnel. Sample containers, preservatives, and treatments for specific constituents are listed in tables 2–4.

Table 2. Sample containers, preservatives, and treatments for analyses of inorganic constituents in water samples from the Idaho National Engineering Laboratory

[Abbreviations: NWQL, National Water Quality Laboratory; RESL, Radiological and Environmental Sciences Laboratory; mL, milliliter. Except where noted, samples were acidified to 0.4 percent, volume per volume, with nitric acid]

Inorganic constituent	Laboratory	Bottle size and type	Preservative, treatment, or both
Sodium, dissolved[1]	NWQL	250-mL polyethylene	Filtered, acidified
Sodium, total recoverable[1]	NWQL	250-mL polyethylene	Acidified
Sodium[2] Chloride[2]	RESL	500-mL polyethylene	Untreated
Sulfate, dissolved Chloride, dissolved Fluoride, dissolved Bromide, dissolved	NWQL	250-mL polyethylene	Filtered
Nutrients, dissolved	NWQL	250-mL or 125-mL brown polyethylene[3]	Filtered, preserved with 1 mL or 0.5 mL of mercuric chloride, chilled
Chromium, total	NWQL	250-mL polyethylene	Acidified
recoverable[1]	NWQL	250-mL polyethylene	Filtered, acidified
Chromium, dissolved[1,4]	NWQL	250-mL polyethylene	Filtered, acidified
Chromium, hexavalent, dissolved[4]			
Chromium, dissolved	RESL	100-mL polystyrene	Filtered, acidified with 1 mL of hydrochloric acid
Trace elements, dissolved	NWQL	250-mL polyethylene	Filtered, acidified
Trace elements, total recoverable	NWQL	500-mL polyethylene	Acidified
Mercury, dissolved	NWQL	250-mL glass	Filtered, preserved with 10 mL of potassium dichromate
Mercury, total recoverable	NWQL	250-mL glass	Preserved with 10 mL of potassium dichromate

[1]The dissolved sodium sample also may be used for the dissolved chromium analysis; the sodium, total recoverable, sample may be used for the chromium, total recoverable, analysis.

[2]Samples to be analyzed for sodium, chloride, and tritium (table 3) by the RESL were collected in one bottle.

[3]Prior to October 1992, samples were collected in the larger bottle which required 1 mL of mercuric chloride as a preservative.

[4]The dissolved chromium and dissolved hexavalent chromium samples were collected in one bottle.

Table 3. Sample containers, preservatives, and treatments for analyses of gross radioactivity and radionuclides in water samples from the Idaho National Engineering Laboratory

[Abbreviations: RESL, Radiological and Environmental Sciences Laboratory; NWQL, National Water Quality Laboratory; mL, milliliter; L, liter. Prior to October 1992, acidified samples analyzed by RESL were acidified to 2 percent, volume per volume (v/v), with hydrochloric acid; since then, samples were acidified to 0.4 percent (v/v) with nitric acid. Except where noted, all acidified samples analyzed by NWQL were acidified to 0.4 percent (v/v) with nitric acid]

Gross radioactivity or radionuclide	Laboratory	Bottle size and type	Preservative, treatment, or both
Gross alpha	RESL	500-mL polyethylene	Acidified
Gross alpha, dissolved	NWQL	1-L polyethylene	Filter, acidified
Gross alpha, dissolved and suspended	NWQL	1-L polyethylene	Untreated
Gross beta	RESL	500-mL polyethylene	Acidified
Gross beta, dissolved	NWQL	1-L polyethylene	Filter, acidified
Gross beta, dissolved and suspended	NWQL	1-L polyethylene	Untreated
Gamma radiation	RESL	500-mL polyethylene	Acidified
Radium-226 Radium-228	NWQL	1-L polyethylene	Filter, acidified with 5 mL of hydrochloric acid
Strontium-90	RESL	500-mL polyethylene	Acidified
Tritium[1]	RESL NWQL	125-mL or 500-mL polyethylene 250-mL or 1-L polyethylene	Untreated Untreated
Americium-241 Plutonium-238 Plutonium-239/240	RESL	500-mL polyethylene	Acidified

[1]Samples to be analyzed for tritium, and sodium and chloride (table 2) by RESL were collected in one bottle.

Table 4. Sample containers, preservatives, and treatments for analyses of organic constituents in water samples from the Idaho National Engineering Laboratory

[Analyzing laboratory was the National Water Quality Laboratory. Abbreviations: mL, milliliter; L, liter]

Organic constituent	Bottle size and type	Preservative, treatment, or both
Total organic carbon	125-mL amber glass	Unacidified, chilled
Volatile organic compounds	40-mL amber glass septum vials	Unacidified, chilled
Semivolatile organic compounds	1-L amber glass	Unacidified, chilled
Pesticides and gross polychlorinated compounds	1-L amber glass	Unacidified, chilled
Aroclors	1-L amber glass	Unacidified, chilled
Total phenols	1-L amber glass	Preserved with 10 mL of copper sulfate-phosphoric acid solution, chilled

Decontamination Procedures

Equipment used to collect water samples from monitoring wells may become contaminated during the collection of previous samples; steps are taken to make certain the equipment is decontaminated. Most wells are equipped with dedicated pumps and only the discharge lines are moved from well to well; therefore, these lines are rinsed thoroughly with deionized water, inside and outside, between sampling sites. Subsequent flushing with at least three borehole volumes of sample water further decontaminates the discharge lines. Because the concentrations of most contaminants are greatest in wells nearest disposal sites and the concentrations decrease with increasing distance from the disposal sites, the most distant wells are sampled first. This process of sampling minimizes the possibility of cross-contamination between wells when portable equipment is used.

Wells not equipped with dedicated pumps are sampled either with a bailer or a portable submersible pump. The bailer is washed with warm water and detergent and rinsed with deionized water prior to use. In the past, the portable submersible pumps were flushed with several gallons of water from one of two wells, USGS 17 or USGS 97. These wells have been periodically analyzed over the years and the concentrations of the constituents that could cause a bias in the analytical results have been well documented (Bartholomay and others, 1993, p. 24, 30–31). This practice was discontinued in May 1993 to further reduce the possibility of introducing unknown variables. Currently, the portable pumps are washed with warm water and detergent and rinsed with deionized water. At the sampling site, the pumps also are flushed with at least three borehole volumes of sample water.

All measuring and sampling equipment that comes into contact with the sample water is thoroughly rinsed with deionized water. The thermometers, probes, and electrodes of the pH meters and the specific conductivity meters are rinsed with deionized water and rinsed again with sample water so when measurements are made, the deionized water will not dilute the sample. Disposable latex gloves are worn, and changed when needed, to ensure that the samples are not contaminated by the field personnel themselves or cross-contaminated by preservatives or previous samples. Unless otherwise specified for a particular analysis or type of container, all the containers are rinsed with sample water, either filtered or unfiltered, as appropriate. The filtration apparatus used before July 1993 consisted of membrane filters placed in an acrylic holder. The holder was a potential source of contamination even though it was rinsed thoroughly with deionized water. To avoid contamination problems, the filters and holders were replaced by totally enclosed disposable capsule filters. Flexible tubing that connects the capsule filters to the sampling port at the well or to the peristaltic pump is thoroughly washed with water and detergent and rinsed with deionized water before use.

Sample Collection

The guidelines for water sample collection are being updated continually in accordance with new safety and environmental regulations and to accommodate the requirements of improved analytical procedures. Guidelines for field treatment of sample containers have been set forth in the NWQL Services Catalog (Pritt and Jones, 1989; A.C. Watterson and A.T. Kashuba, USGS, written commun., 1993). When field rinsing is required, the sample containers are rinsed three times with sample or deionized water before filling. The samples are untreated or filtered and preserved as established by the NWQL (Pritt and Jones, 1989; A.C. Watterson and A.T. Kashuba, USGS, written commun., 1993) or in the

manner recommended by Bodnar and Percival (1982) depending upon the analyses requested. Although the sample collection procedures changed from 1989 through 1993, each sample of a replicate pair was always collected in the same manner.

Most sampling sites are wells with dedicated submersible pumps. Wells without dedicated pumps are sampled with bailers or portable pumps. Grab samples are collected at the seven surface-water sites.

The INEL Project Office maintains mobile field laboratories in which the supplies and equipment necessary for sampling are available for immediate sample processing. Field measurements are taken in this relatively clean and protected environment, and samples are preserved and prepared for shipping without delay.

At the INEL, special precautions are taken to ensure that the water samples are representative of the ground water at the sampling site. To achieve this, a volume of water equivalent to a minimum of three borehole volumes is pumped from each well. In addition, the temperature, pH, and specific conductivity are monitored during pumping, using methods described by Wood (1981) and Hardy and others (1989). When the wells have been purged and measurements of these properties indicate probable hydraulic and chemical stability, field personnel collect the samples. Some wells do not contain or produce enough water to be purged three borehole volumes, so samples are collected from the bailer as soon as the temperature, pH, and specific conductivity measurements stabilize.

Before July 1993, samples that required filtering were collected from a 4-L polyethylene container using a peristaltic pump. The 4-L container was rinsed thoroughly with the well water before being filled and allowed to overflow. The intake tubing of the peristaltic pump was rinsed with sample water and inserted into the container. A new 0.45-micron membrane filter was placed in the acrylic filter holder and rinsed with 750 mL of water. Because disposable capsule filters are used now, the filters are connected by tubing to the portable discharge line. At the few sites where a bailer is used or where grab samples are collected, the filters are connected by flexible tubing to the peristaltic pump. Regardless of the filtering technique, 1 liter of sample water is run through the capsule filter and tubing before the sample bottle is rinsed and filled. If the water at the sampling site contains large amounts of suspended material, it may be necessary to rinse the filter with 1 liter of deionized water, rather than with sample water, before the container is rinsed and filled. The bottles are then capped and transported into the field laboratory for preservation. After the sample is preserved, the bottles are recapped and labeled, and the caps are sealed with laboratory film.

To minimize analyte loss by biological processes or volatilization, samples for nutrient and organic constituent analyses are chilled to approximately 4°C. The samples are kept on ice until they are received at the laboratory, where they are refrigerated.

All water samples are stored in the mobile field laboratory until they can be transferred to a secured storage area. After a sufficient number of samples is collected, and before any holding-time limitations are met, the samples are delivered to the appropriate laboratory for analysis. Holding-time limitations for the nutrients and organics constituents are 7 and 14 days, respectively. Samples for the NWQL are shipped by overnight-delivery mail in a sealed ice chest and usually are sent to the laboratory within 5 days of collection. The samples to be analyzed by the RESL are hand-carried to the analytical chemistry area.

Conditions during sample collection are recorded in a bound field logbook, and a chain-of-custody form is used to track samples from the time of collection until delivery to the laboratory. These procedures were instituted in September 1987, and all records are available for inspection at the INEL Project Office.

Analytical Methods and Reporting of Data

Methods of detection or instrumentation used by the laboratories for each type of analysis and their corresponding detection limits or reporting levels are listed in tables 5–7.

Detection limits are used by the RESL. Because they are a function of sample matrix, sample size, and type of measurement, the limits are intended as guides to order-of-magnitude sensitivities and can easily change by a factor of two or even more for the conditions specified (Bodnar and Percival, 1982, p. DL-1-1). With each analytical result, the RESL reports an analytical uncertainty. With each radiochemical result, the RESL reports a propagated random uncertainty, which is calculated using many variables, including the yields, appropriate half-lives, counting efficiencies, and count times. This uncertainty is one standard deviation as defined on the DOE, RESL Sample Record Sheet (ID F–5484.1A, written commun., Rev. 12–1988).

The NWQL uses reporting levels that are defined as the lowest measured concentration of a constituent that may be reliably reported using a given analytical method. Because of the unpredictable matrix effects on detection limits, the reporting limit is set somewhat higher than the detection limit (Pritt and Jones, 1989, p. 1–6). For radiochemical results only, the NWQL reports a result and a value twice the standard deviation. Therefore, when comparing the results of analyses of gross radioactivity and radionuclides by the NWQL and the RESL, it is important to remember that two standard deviations are reported by the NWQL and one standard deviation is reported by the RESL.

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES, REPLICATE PAIRS OF SAMPLES

Replicate pairs of samples were collected sequentially and sent to the same laboratory with different identifiers. For example, a sample collected from the well identified as USGS 36 may have a replicate sample identified as QA-4. There was no correlation between the identifier of the QA replicate and the routine water-quality sample; the field personnel selected a QA number sequentially during a sampling session and recorded that number in their field logbooks along with the required information about that particular site. This type of sample is useful in determining the laboratory's analytical reproducibility related to equipment, materials, or analysts. Replicate samples also can be used to measure the variability due to the collection process. Beginning in 1993, QA/QC samples were collected for comparison with routine water-quality samples that had been collected at the same site for the same constituents within the previous 24 hours. This type of QA/QC sample addresses variability related to ambient conditions at the site, field personnel, field-measurement instruments, and sampling equipment.

Statistical Comparisons of Replicate Pairs of Samples

If the standard deviations are known, it is possible to determine, within a specified confidence level, whether the results of a replicate pair of samples are statistically equivalent. When the standard deviations are unknown,

Table 5. Analytical methods used to determine inorganic constituents in water samples from the Idaho National Engineering Laboratory, with detection limits or reporting levels

[Abbreviations: RESL, Radiological and Environmental Sciences Laboratory; NWQL, National Water Quality Laboratory; mg/L, milligram per liter; µg/L, microgram per liter]

Inorganic constituent	Laboratory	Analytical method	Detection limit[1] or reporting level[2]
Sodium	RESL	Ion selective electrode	2 mg/L
	NWQL	Atomic absorption	0.1 mg/L
Sulfate	NWQL	Turbidimetry	1 mg/L
	NWQL	Ion chromatography	0.1 mg/L
Chloride	RESL	Ion selective electrode	2 mg/L
	NWQL	Colorimetry	0.1 mg/L
	NWQL	Ion chromatography	0.1 mg/L
Fluoride	NWQL	Ion selective electrode	0.1 mg/L
	NWQL	Ion chromatography	0.1 mg/L
Bromide	NWQL	Ion chromatography	0.01 mg/L
Nutrients	NWQL	Colorimetry	0.01–0.2 mg/L
Trace elements	NWQL	Atomic absorption	1–10 µg/L
	NWQL	Inductively coupled plasma	1–10 g/L
Chromium	RESL	Atomic absorption	50 µg/L
	NWQL	Direct current plasma	1 µg/L
	NWQL	Atomic absorption	1 µg/L
Mercury	NWQL	Flameless atomic absorption	0.1 µg/L

[1]RESL uses detection limits and NWQL uses reporting levels.
[2]Multiple reporting levels are dependent upon the constituent.

Table 6. Analytical methods used to determine gross radioactivity and radionuclides in water samples from the Idaho National Engineering Laboratory, with detection limits or reporting levels

[Abbreviations: RESL, Radiological and Environmental Sciences Laboratory; NWQL, National Water Quality Laboratory; pCi/L, picocuries per liter]

Gross radioactivity or radionuclide	Laboratory	Analytical method	Detection limit or reporting level[1]
Gross alpha	RESL	Scintillation	3 pCi/L
	NWQL	Low background alpha-beta counter	0.6 pCi/L
Gross beta	RESL	Low background beta counter	5 pCi/L
	NWQL	Low background alpha-beta counter	0.6 pCi/L
Gamma radiation	RESL	Gamma spectroscopy	60 pCi/L
Radium-226	NWQL	Radon emanation	2×10^{-2} pCi/L
Radium-228	NWQL	Beta counting	1 pCi/L
Strontium-90	RESL	Low background beta counter	5 pCi/L
Tritium	RESL	Liquid scintillation	200 pCi/L
	NWQL	Enrichment, gas counting	0.1 pCi/L
Americium-241	RESL	Alpha spectrometry	6×10^{-2} pCi/L
Plutonium-238	RESL	Alpha spectrometry	4×10^{-2} pCi/L
Plutonium-239/240	RESL	Alpha spectrometry	4×10^{-2} pCi/L

[1] RESL uses detection limits and NWQL uses reporting levels.

Table 7. Analytical methods used to determine organic constituents in water samples from the Idaho National Engineering Laboratory, and reporting levels

[Analyzing laboratory is the National Water Quality Laboratory. Units: mg/L, milligram per liter; µg/L, microgram per liter]

Organic constituent	Analytical method	Reporting level[1]
Total organic carbon	Wet oxidation	0.1 mg/L
Volatile organic compounds	Gas chromatography/mass spectrometry	0.2–20 µg/L
Semivolatile organic compounds	Gas chromatography/mass spectrometry	5–30 µg/L
Pesticides and gross polychlorinated compounds	Gas chromatography	0.01–1 µg/L
Aroclors	Gas chromatography	0.1 µg/L
Total phenols	Colorimetry	1 µg/L

[1]Multiple reporting levels are dependent upon the constituent.

approximations of the standard deviations are used for the statistical comparison. The comparison can be done using an adaptation of the equation to determine the standard deviate, Z, or the number of standard deviations the variable deviates from the mean (Volk, 1969, p. 55), where Z is the ratio of the absolute value of the difference of the two results and the square root of the sum of the squares of the standard deviations (the pooled standard deviation). In that way, a comparison can be made of two analytical results on the basis of the precision, or an approximation of the precision, associated with each of the results:

$$Z = \frac{|x - y|}{\sqrt{(s_x)^2 + (s_y)^2}} \qquad (1)$$

where

x is the result of the routine water-quality sample,

y is the result of the QA/QC sample,

s_x is the standard deviation of x, and

s_y is the standard deviation of y.

When the population is distributed normally and the standard deviation is known, the analytical results of replicate pairs can be considered statistically equivalent at the 95-percent confidence level if the Z-value is less than or equal to 1.96. When the population is not distributed normally or an approximation of the standard deviation is used, a Z-value less than or equal to 1.96 must be considered a guide when testing for equivalence. At the 95-percent confidence level, the probability of error is 0.05. In other words, when a Z-value is less than or equal to 1.96, the results are within approximately two standard deviations of each other. Equation 1 is essentially the equation used to compare replicate data in the USGS protocol for collection and processing surface-water samples (Horowitz and others, 1995, p. 36).

Instead of setting a value that is approximately equal to two standard deviations as a test of equivalence, the level of significance, or p-value, which indicates the weight of the evidence to reject the null hypothesis, $x \pm s_x = y \pm s_y$, may be determined. The null hypothesis is tested using the Z-value as the test statistic. The Z-value is calculated by using equation 1, then the p-value is determined by referring to table 62 in the Supplemental Information Section. Assuming the distribution is normal, the p-value is the area under the curve for the Z-value. The greater the Z-value, the smaller the p-value and the more likely that the results of the replicate pair are not equivalent, and the null hypothesis will be rejected. When Z = 1.96, the p-value = 0.0250 for a one-tailed test and 0.0500 for a two-tailed test (table 62). This shows that these p-values are equivalent to the 95-percent confidence level and $\alpha = 0.05$, where α is the probability that the null hypothesis will be rejected when true.

Inorganic Constituents

Equation 1 cannot be applied directly to the results when no standard deviations or uncertainties are reported. The analyses for inorganic constituents, which were done at the NWQL, were not reported with standard deviations; therefore, approximations of standard deviations were used. The USGS Branch of Quality Assurance (BQA) conducts a Blind Sample Program (BSP) in which reference samples disguised as environmental samples are submitted to the NWQL. A report by Maloney and others (1993) describes the program and evaluates the analytical results. The BSP data are stored in the QADATA program that is available through the USGS computer network (Lucey, 1990, p 1). The statistical analyses included in the program generate linear regression equations that allow the calculation of a most probable deviation (MPD) at any concentration for most analyses. A minimum MPD has been established for a few analyses at very low concentrations (Maloney and others, 1993, p. 4). The linear regression equations can be used to determine if the analytical results of the replicate pairs are statistically equivalent by calculating an MPD for each result and substituting for the standard deviation in equation 1. Because these are approximate standard deviations, the Z-value of 1.96 must be considered a guide when testing for equivalence.

The results of the replicate pairs of the inorganic constituent analyses and the Z-values for each replicate pair are included in tables 10–32. If the analytical results of the pair were not statistically equivalent, that is, if the Z-value was greater than 1.96, an "N" appears in the column labeled "Remark."

For many samples, the analytical results were less than the reporting level. If the results of both samples of the replicate pair were less than the reporting level, the results were assumed to be equivalent and the Z-value was reported as a zero. If, however, only one of the results was less than the reporting level, one of two approaches was taken.

First, if one result was less than the reporting level and the other exceeded the reporting level, the numerical value and the MPD of the numerical value of the reporting level were substituted in equation 1 for the result at the reporting level. For example, the analytical results of fluoride in the replicate pair collected at USGS 97 on June 7, 1990, were <0.1 mg/L and 0.4 mg/L (table 13). Using the minimum MPD of 0.075 mg/L that has been set for this analysis (Maloney and others, 1993), the results were 0.1±0.075 mg/L and 0.4±0.075 mg/L. The Z-value, calculated from equation 1, equaled 2.83. The Z-value was greater than 1.96 and, therefore, was outside the 95-percent confidence interval. The

results of the replicate pair were not equivalent and an "N" appears in the column labeled "Remark."

Second, if one result was less than the reporting level and the other was at the reporting level, the MPD of the result was calculated at the reporting level using the linear regression equation for that analysis. It is impractical to use equation 1 because the Z-value will always equal zero. Therefore, to compare the two results using the precision associated with them, the deviation was multiplied by 1.96. If the range of the deviation had included zero, the results would have been equivalent because any result less than the reporting level was included in the 95-percent confidence interval. For example, the analytical results of fluoride analyses of the replicate pair collected at USGS 12 on June 15, 1990, were <0.1 mg/L and 0.1 mg/L (table 13). The linear regression equation generated an MPD of 0.018 mg/L, but a minimum MPD of 0.075 mg/L has been set for this analysis (Maloney and others, 1993, p. 5). Therefore, the result of 0.1 mg/L would have an MPD of 1.96×0.075 mg/L at the 95-percent confidence level: 0.1±0.147 mg/L. The range included zero and the results were considered equivalent. If the range had not included zero, as often is the case when the MPD is very small, equivalency could not have been determined and a "U" would have appeared in the column labeled "Remark" signifying that equivalence was uncertain.

Gross Radioactivity and Radionuclides

The use of equation 1 is straightforward in determining if the results of radiochemical analyses of a replicate pair of samples were equivalent. Because the NWQL reported radiochemical results and two standard deviations, it was necessary to divide the value by two to compute the one standard deviation required by equation 1. The results and reported standard deviations for the analyses of gross radioactivity and radionuclides in replicate pairs and the Z-values are listed in tables 33–49. Calculations using equation 1 were performed on each replicate pair. If the analytical results of the pair were not statistically equivalent, an "N" appears in the column labeled "Remark."

Organic Constituents

Organic constituents were not included in the BSP. Therefore, for total organic carbon and total phenol results, standard deviations were calculated from the relative standard deviations (RSD) reported by Wershaw and others (1987, p. 15–16) and in the NWQL Services Catalog (Pritt and Jones, 1989, p. 5–28) for these two types of analyses, respectively. The standard deviations of the volatile organic compounds were calculated from the RSD's provided by Rose and Schroeder (1995, p. 18–23). Analytical results for organic constituents are included in tables 50–52. Calculations using equation 1 were performed on each replicate pair and the Z-values also are presented in the tables. If analytical results of the pair were not statistically equivalent, an "N" appears in the column labeled "Remark." If equivalence could not be determined, a "U" appears in the column labeled "Remark" signifying that equivalence was uncertain. If the results of both samples of the replicate pair were less than the reporting level, the results were assumed to be equivalent and the Z-value is reported as a zero.

More than 99 percent of the results of the 752 replicate pairs analyzed for volatile organic compounds were less than the reporting level and were considered equivalent. Only the replicate pairs analyzed for the volatile organic compounds, which were at or greater than the reporting levels, are tabulated (table 51). Because all 945 replicate pairs analyzed for semivolatile organic compounds, pesticides, gross polychlorinated compounds, and

Aroclors were below the reporting level, and because the number of compounds was so large, the data also are not tabulated. The sites sampled and the corresponding volatile organic compound, semivolatile organic compound, pesticide, gross polychlorinated compounds, and Aroclor analyses are listed in table 63. The compounds included with each type of organic constituent are listed in table 64.

Summary of Statistical Comparisons of Replicate Pairs of Samples

The statistical comparisons of the replicate pairs showed that for each constituent, except ammonia plus organic nitrogen, orthophosphate, iron, manganese, radium-226, total organic carbon, and total phenols, 90 percent or more of the results of the replicate pairs were equivalent. Lack of equivalence between results of replicate pairs indicates a problem. Because many factors, such as field methods, ambient conditions, laboratory procedures, and nonanalytical errors can affect precision, the source of the inconsistency cannot always be pinpointed.

The following sections summarize the statistical comparisons for each constituent. Graphical summaries are provided in figures 4–8.

Inorganic Constituents

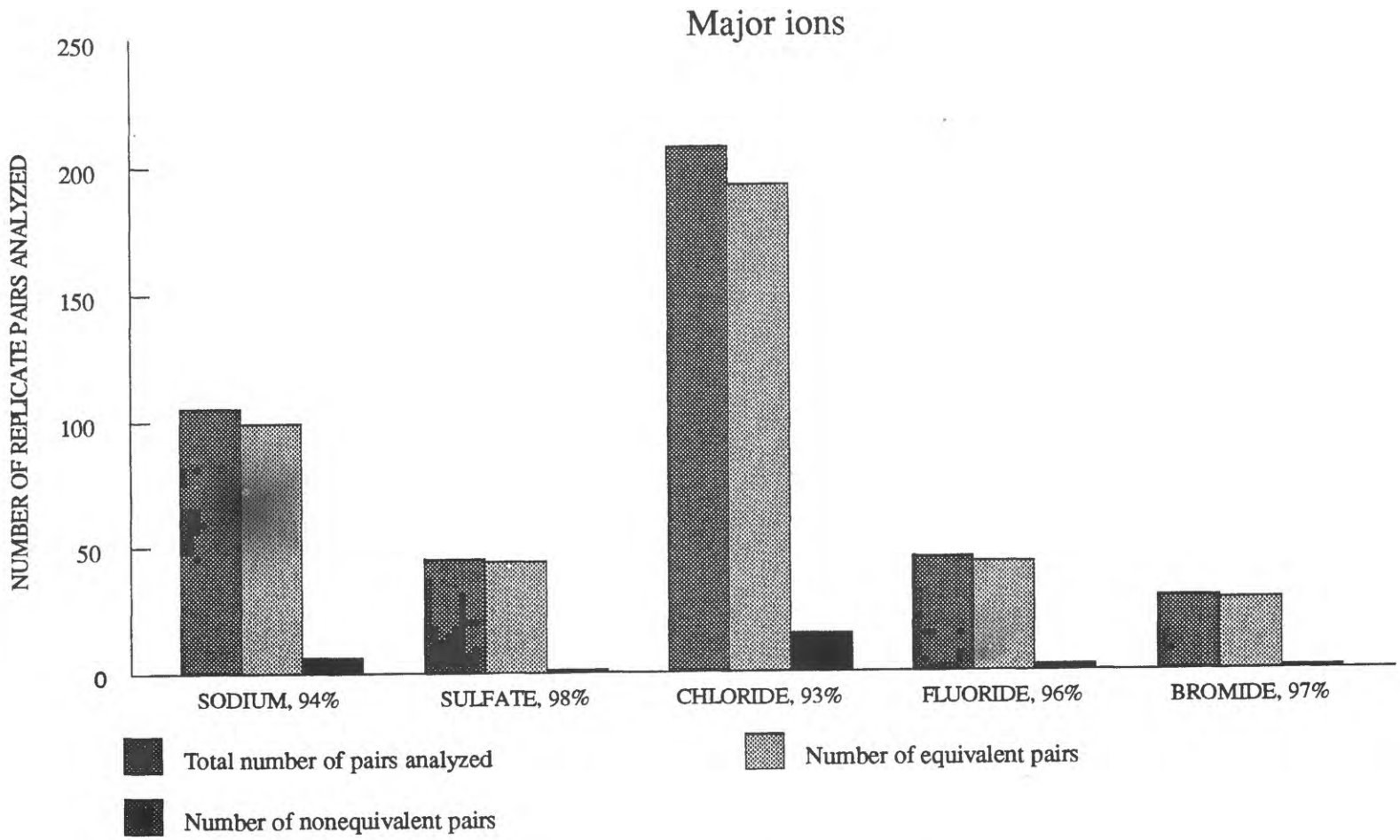
Major ions.—Several replicate pairs of samples were analyzed by the NWQL for major ions. The major ions and the number of replicate pairs follow: sodium, 105; sulfate, 45; chloride, 207; fluoride, 45; and bromide, 29. For all but the bromide analyses, the Z-values were calculated with the analytical results and the MPD's determined with the regression equations formulated from the data collected by the BQA. Because the bromide analysis is not included in the BSP, an RSD of 15 percent (Pritt and Jones, 1989, p. 5–6) was used in equation 1.

Major ions analyzed and percentages of the analytical results of the replicate pairs that were equivalent follow: sodium, 94 percent; sulfate, 98 percent; chloride, 93 percent; fluoride, 96 percent; and bromide, 97 percent. The Z-values indicated that 25 replicate pairs analyzed for major ions were not equivalent and 431 pairs, or 94 percent of the results, were equivalent.

Nutrients.—Several replicate pairs of samples were analyzed by the NWQL for dissolved nutrients. The nutrients and the number of replicate pairs follow: nitrite, 61; nitrite plus nitrate, 68; ammonia plus organic nitrogen, 11; ammonia, 59; and orthophosphate, 64. For all but the nitrite analyses, the Z-values were calculated with the analytical results and the MPD's determined with the regression equations formulated from the data collected by the BQA. Because the nitrite analysis is not included in the BSP, a standard deviation of 0.001 mg/L (Fishman, 1993, p. 147) was used for comparison in equation 1.

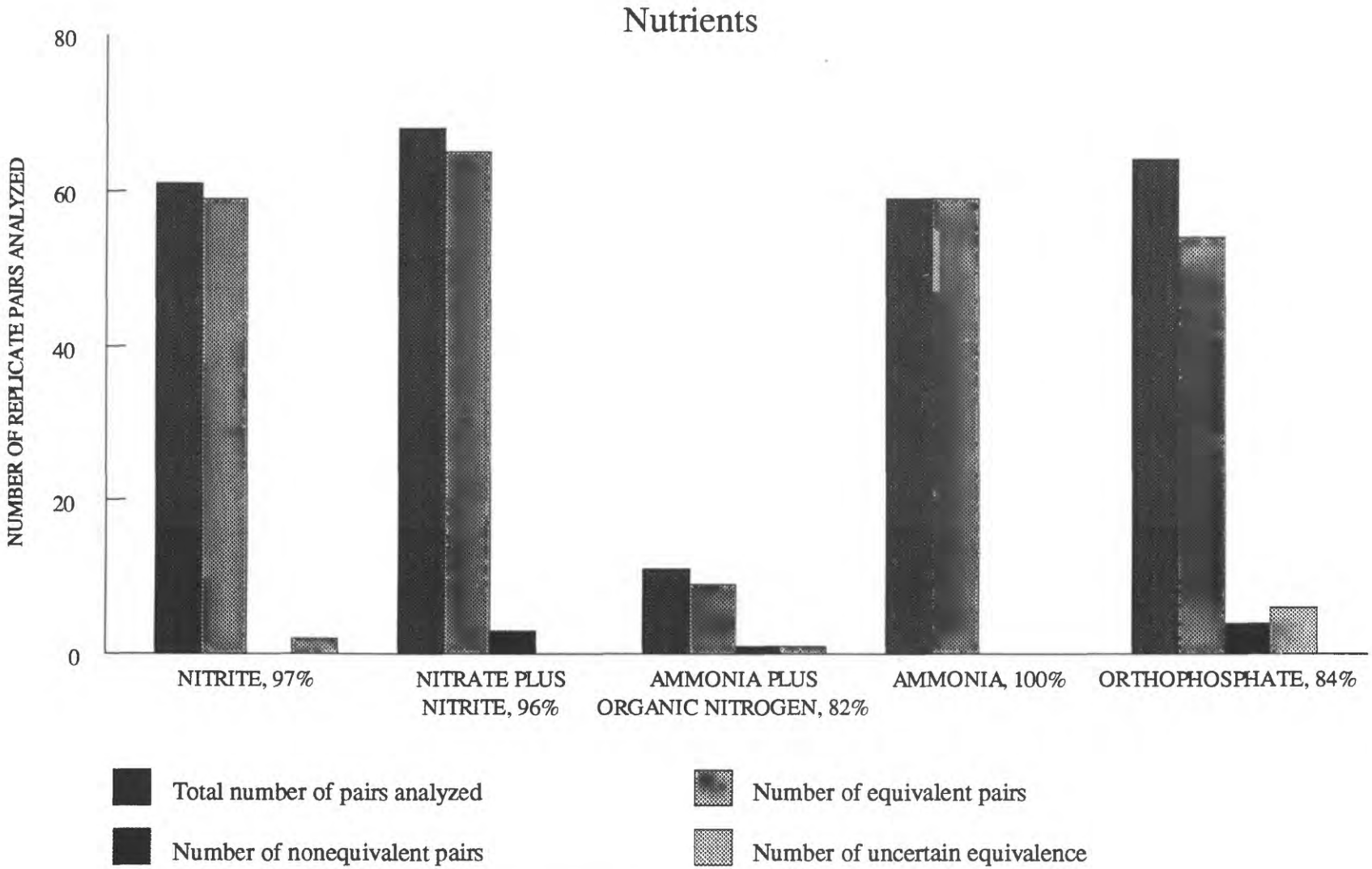
Nutrients analyzed and percentages of the analytical results of the replicate pairs that were equivalent, or that were uncertain follow: nitrite, 97 percent equivalent, 3 percent uncertain; nitrite plus nitrate, 96 percent equivalent; ammonia plus organic nitrogen, 82 percent equivalent, 9 percent uncertain; ammonia, 100 percent equivalent; and for orthophosphate, 84 percent equivalent, 9 percent uncertain. The Z-values indicated that 8 replicate pairs analyzed for nutrients were not equivalent, 9 pair were uncertain, and 246 pairs, or 94 percent of the results, were equivalent.

Trace elements.—Several replicate pairs of samples were analyzed by the NWQL for trace elements; the analyses were for either dis-



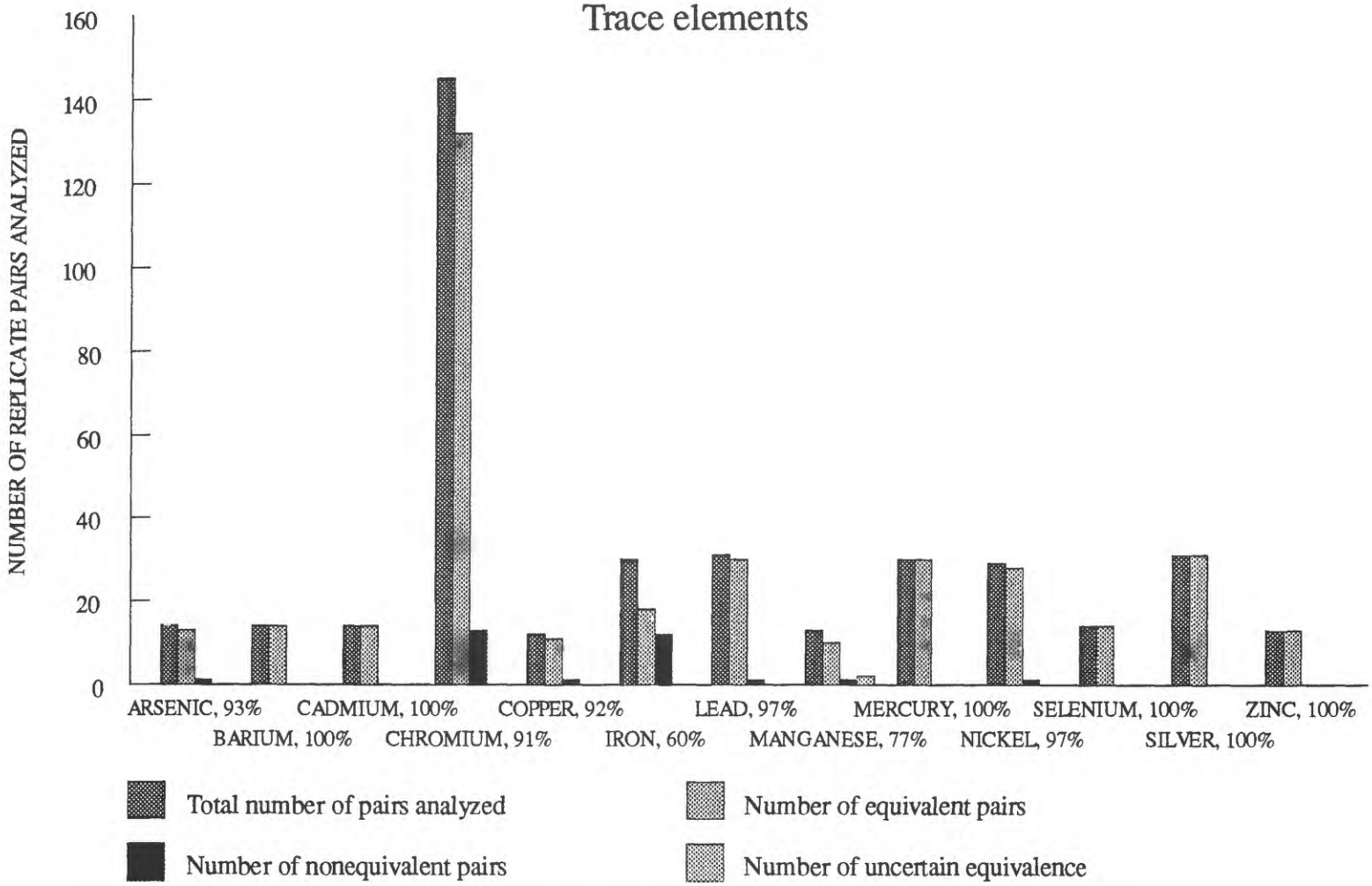
Explanation: Analytes are followed by the percentages of pairs that were equivalent.

Figure 4. Results of statistical comparisons of replicate pairs of samples analyzed for major ions



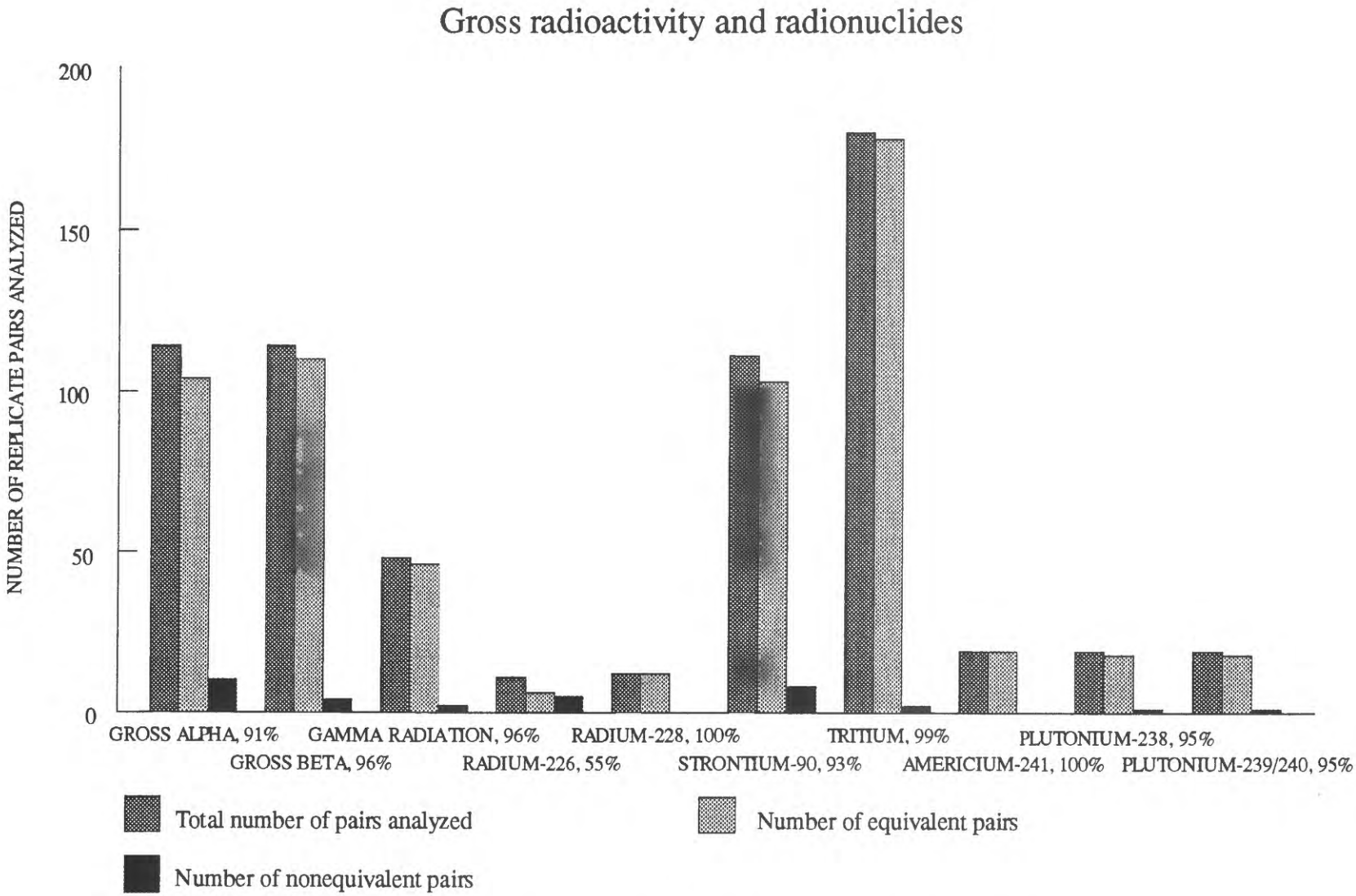
Explanation: Analytes are followed by the percentages of replicate pairs that were equivalent.

Figure 5. Results of statistical comparisons of replicate pairs of samples analyzed for nutrients



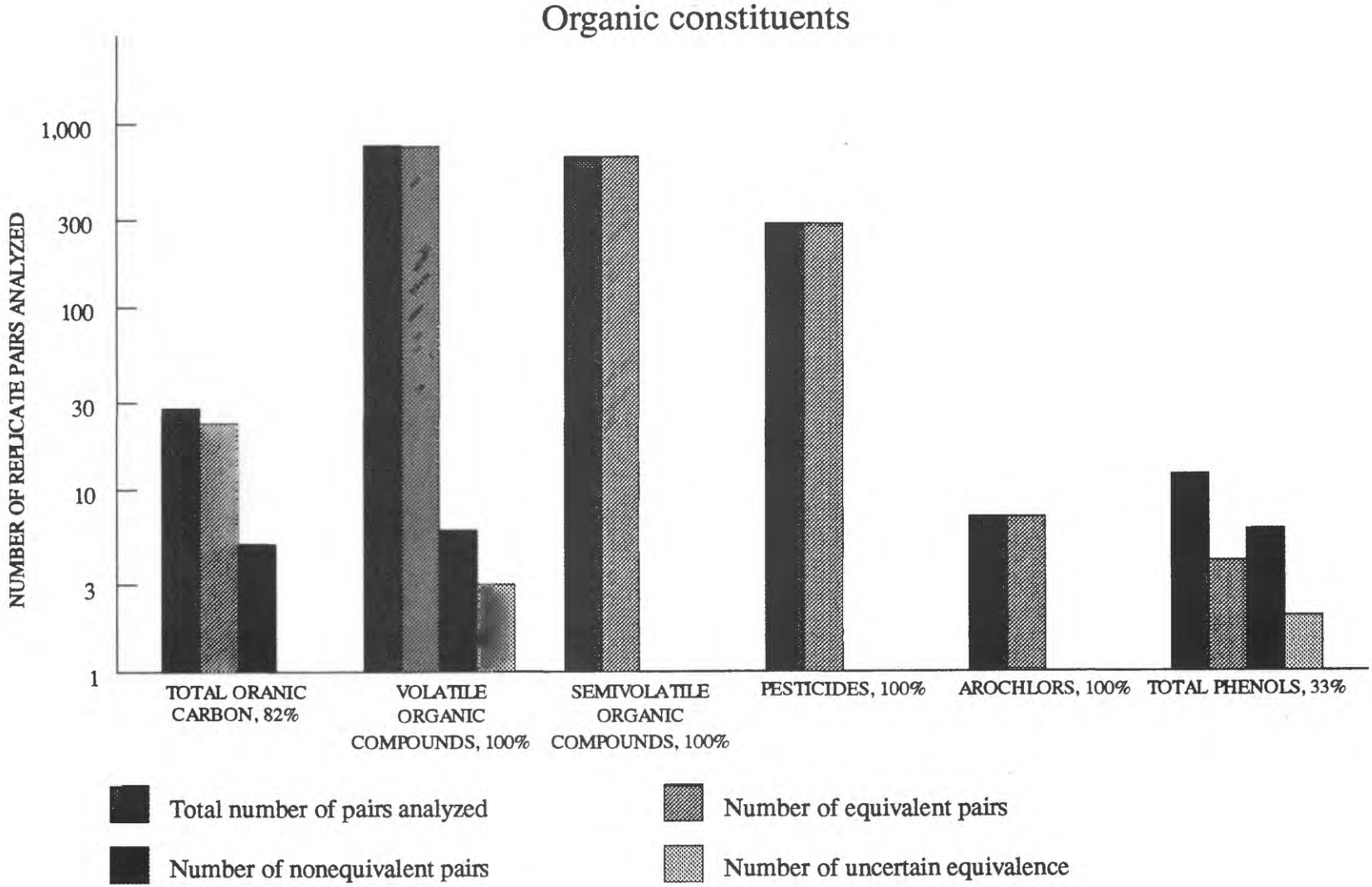
Explanation: Analytes are followed by the percentages of pairs that were equivalent.

Figure 6. Results of statistical comparisons of replicate pairs of samples analyzed for trace elements



Explanation: Analytes are followed by the percentages of replicate pairs that are not equivalent.

Figure 7. Results of statistical comparisons of replicate pairs of samples analyzed for gross radioactivity and radionuclides



Explanation: Analytes are followed by the percentages of replicate pairs that are equivalent.

Figure 8. Results of statistical comparisons of replicate pairs of samples analyzed for organic constituents

solved or total recoverable constituents. The trace element and the number of replicate pairs follow: arsenic, 14; barium, 14; cadmium, 14; chromium, 145; copper, 12; iron, 30; lead, 31; manganese, 13; mercury, 30; nickel, 29; selenium, 14; silver, 31; and zinc, 13. All the Z-values were calculated with the analytical results and the MPD's determined with the regression equations formulated from the data collected by the BQA.

Trace elements analyzed and percentages of the analytical results of the replicate pairs that were equivalent follow: arsenic, 93 percent; barium, 100 percent; cadmium, 100 percent; chromium, 91 percent; copper, 92 percent; iron, 60 percent; lead, 97 percent; manganese, 77 percent; mercury, 100 percent; nickel, 97 percent; selenium, 100 percent; silver, 100 percent; and zinc, 100 percent. The Z-values indicated that 30 replicate pairs analyzed for trace elements were not equivalent, 2 pairs that were analyzed for manganese were uncertain, and 358 pairs, or 92 percent of the results, were equivalent.

Statistical comparisons of the iron analyses indicated that only 60 percent of the results of the pairs were equivalent. The BQA also has noted significant lack of precision for the same procedure at the NWQL (Maloney and others, 1993, p. 11). Because the unfiltered samples collected at the INEL were for total recoverable iron, they may not have been representative samples owing to inhomogeneity of the water samples or contamination from the well structures. However, the samples analyzed for total recoverable iron in the BSP were split samples that were also analyzed for dissolved iron; the difference in the analyses was an added digestion procedure (Maloney and others, 1993, p. 3). This indicated that the lack of equivalence between replicate pairs analyzed for total recoverable iron partly resulted from laboratory conditions.

The argument that it may be difficult to compare replicate samples analyzed for a total recoverable constituent, rather than for the dissolved constituent, is valid. It is possible that sequential ground-water samples may be inhomogeneous because sediment is present in each sample of a replicate pair in different quantities or different compositions. Therefore, sediment may contribute in varying amounts to the concentration of the total recoverable constituent, and the results of the replicate pair would not be equivalent statistically.

Although the BQA indicated that a lack of precision has been shown for manganese (Maloney and others, 1993, p. 11), that conclusion could not be drawn from data collected at the INEL for the water-quality monitoring program. Sixty-two percent of the concentrations of total recoverable manganese were less than the reporting level and were considered equivalent. Equivalency of two of the pairs could not be determined. Concentrations in three pairs were greater than the reporting level; results of one pair were not equivalent. Although only 77 percent of the manganese results were equivalent, lack of precision was not necessarily indicated. More uncensored data are needed to make that determination; only the results of three replicate pairs were greater than the reporting level and could be compared statistically for this analysis.

Gross radioactivity and radionuclides

Gross alpha radioactivity.—There were 114 replicate pairs of samples analyzed by the NWQL and the RESL for gross alpha radioactivity. The NWQL reported results as gross alpha, dissolved as thorium-230, suspended as thorium-230, dissolved as natural uranium, and suspended as natural uranium. The RESL reported results as gross alpha radioactivity.

The Z-values indicated that 10 replicate pairs were not equivalent and 104 pairs, or 91 percent of the results, were equivalent.

Gross beta radioactivity.—There were 114 replicate pairs of samples analyzed by the NWQL and the RESL for gross beta radioactivity. The NWQL reported results as gross beta, dissolved as cesium-137, suspended as cesium-137, dissolved as strontium-90/yttrium-90, and suspended as strontium-90/yttrium-90. The RESL reported results as gross beta radio-activity. The Z-values indicated that 4 replicate pairs were not equivalent and 110 pairs, or 96 percent of the results, were equivalent.

Gamma radiation.—There were 48 replicate pairs of samples analyzed by the RESL for gamma radiation. The Z-values indicated that 2 replicate pairs were not equivalent and 46 pairs, or 96 percent of the results, were equivalent.

Radium-226 and radium-228.—There were 12 replicate pairs of samples analyzed by the NWQL for radium-226 and radium-228. Eleven of the pairs were analyzed for radium-226 and 12 for radium-228. The Z-values indicated that 5 replicate pairs analyzed for radium-226 were not equivalent and 6 pairs, or 55 percent of the results, were equivalent. The Z-values indicated that all 12 pairs analyzed for radium-228, or 100 percent, were equivalent.

The replicate pairs analyzed for radium-226 showed a significant lack of precision when compared statistically. These were anayzed for the dissolved constituent, rather than the total recoverable constituent; therefore, sample inhomogeneity was not the problem. Since all the radium-228 replicate pairs, which were collected sequentially with the radium-226 pairs, were equivalent, it is unlikely that the inconsistencies were due to the sample collection process. No gross radioactivity or radionuclide analyses, including radium-226, are included in the BSP; therefore, the BQA does not review this analysis. The reason for the discrepancy could not be clearly defined.

Strontium-90.—There were 111 replicate pairs of samples analyzed by the RESL for strontium-90. The Z-values indicated that 8 replicate pairs were not equivalent and 103 pairs, or 93 percent of the results, were equivalent.

Tritium.—There were 180 replicate pairs of samples analyzed for tritium; 179 pairs were analyzed by the RESL, and 1 pair was analyzed by the NWQL. The Z-values indicated that 2 replicate pairs were not equivalent and 178 pairs, or 99 percent of the results, were equivalent.

Transuranics: americium-241, plutonium-238, and plutonium-239/240.—There were 19 replicate pairs of samples analyzed by the RESL for three transuranic isotopes. The comparisons indicated that the results of all replicate pairs, but one, were equivalent for each isotope. The Z-values indicated that 2 replicate pairs were not equivalent and 55 pairs, or 96 percent of the results, were equivalent.

Organic constituents

Total organic carbon.—There were 28 replicate pairs of samples analyzed by the NWQL for total organic carbon. For most analyses, an MPD derived from linear regression equations generated by the BQA from the BSP data or a reported standard deviation may be used to quantify the precision associated with the analytical results. Neither an MPD nor a standard deviation was available for analysis of total organic carbon.

The NWQL Services Catalog (Pritt and Jones, 1989) lists the RSD for total organic carbon as 6 percent. An RSD of 6 percent

resulted in a precision estimate that indicated that only 29 percent of the replicate pairs were equivalent when equation 1 was applied.

The precision data for the dissolved organic carbon method (Wershaw and others, 1987, p. 15), was used to determine a linear regression equation for calculating standard deviations at low concentrations because there is no precision data for the total organic carbon method. The precision statement for the total organic carbon method only states that the percent RSD for total organic carbon will be greater than that for dissolved organic carbon (Wershaw and others, 1987, p. 16). When using the analytical results and the standard deviations at low concentrations calculated with the linear regression equation, the Z-values indicated that 5 replicate pairs were not equivalent and 23 pairs, or 82 percent of the results, were equivalent.

Volatile organic compounds.—There were 18 replicate pairs of samples analyzed by the NWQL for 36 volatile organic compounds. In 1992, the volatile organic compound analyses included 25 additional compounds and in 1993, 2 more compounds were added. In the replicate pairs, only 9 of those 63 compounds were found with concentrations that were at or greater than the reporting level. Because neither an MPD nor a standard deviation was available for these nine volatile organic compounds, the standard deviations were calculated from the RSD's provided by Rose and Schroeder (1995). The following is a list of the compounds and the RSD's used to determine the standard deviations for the statistical comparisons: bromoform, 14 percent; bromodichloromethane, 8.3 percent; carbon tetrachloride, 8.4 percent; chloroform, 11 percent; dibromochloromethane, 17 percent; dichlorodifluoromethane, 11 percent; tetrachloroethylene, 12 percent; 1,1,1-trichloroethane, 12 percent; and trichloroethylene, 13 percent.

All the replicate pairs analyzed for the compounds with concentrations exceeding the reporting level were compared for statistical equivalence using equation 1. Six replicate pairs were not equivalent and three pairs were uncertain. Four pairs of the results that were not equivalent were from one sample. Of the 752 comparisons, the Z-values indicated that 743 replicate pairs, or greater than 99 percent of the results, were equivalent.

Semivolatile organic compounds, pesticides, gross polychlorinated compounds, and Aroclors.—There were 12 replicate pairs of samples analyzed by the NWQL for 54 semivolatile organic compounds. In 1992, the semivolatile organic compound analyses included three additional compounds. The replicate pairs also were analyzed for 19 pesticides and for gross polychlorinated biphenyls and naphthalenes. One replicate pair was analyzed for an additional 32 pesticides and 7 Aroclors. All of the analytical results were less than the reporting level; therefore, 945 replicate pairs, or 100 percent of the results, were equivalent.

Total phenols.—There were 12 replicate pairs of samples analyzed by the NWQL for total phenols. This analysis is not included in the BSP; therefore, the comparisons of the results of the replicate pairs and the standard deviations were calculated using the RSD of 12 percent reported in the NWQL Services Catalog (Pritt and Jones, 1989, p. 5–49). Six replicate pairs were not equivalent and two pairs were uncertain. The Z-values indicated that 4 replicate pairs, or 33 percent of the results, were equivalent.

QUALITY ASSURANCE/QUALITY CONTROL SAMPLES, BLANK SAMPLES

Blank samples were prepared using inorganic-free blank water (IBW) from the Quality of Water Service Unit (QWSU) of the

Office of Water Quality in Ocala, Fla.; volatile organic compound blank water (VBW) from the NWQL; distilled, or distilled and deionized water from other sources; and water from USGS 17 and USGS 97 (fig. 3). There are several different kinds of blanks; examples are: source-solution, trip, and equipment.

A source solution is water that is free of the constituents of interest and is used as a stock solution for other blanks. For example, deionized water may be used to prepare an equipment blank of the filtration apparatus, and the source-solution blank would be a sample of the deionized water before it was filtered. Analytical results of a source-solution blank are used to determine the variability of methods or analysts within a laboratory. Also, they are used to determine whether the laboratory has introduced a bias into the analytical process. Furthermore, this type of blank is used to determine if, in fact, the source solution is free of contaminants.

Trip blanks travel with samples during collection, storage, and shipment to detect bias related to handling procedures or ambient conditions.

An equipment blank that has been run through all or part of the sampling apparatus can be used to detect a bias that has been introduced through use of that equipment. Equipment blanks can be used to identify contamination from the sample-collection or equipment-cleaning processes. Inorganic-free or deionized water is used at the present time for all equipment blanks. In the past, however, field personnel prepared equipment blanks for the portable pumps with well-characterized environmental water from USGS 17 and USGS 97 by rinsing the pumps with several volumes of the well water and collecting a sample to be analyzed for the constituents of interest.

Until October 1989, QA/QC samples were numbered using sequential site identifiers of nonexistent sites. Since then, sequential QA designations were given to QA/QC samples starting at QA-1 each sampling session; QAS designations were given to the Naval Reactors Facility QA/QC samples and were all numbered in sequence from QAS-1 to QAS-33; QAB-1 was given to an equipment blank prepared between sampling sessions. Sources and descriptions of blanks and equipment blanks that were analyzed by both the NWQL and the RESL for the water-quality monitoring program are presented in tables 8–9. Analytical results of the blanks and equipment blanks are presented in tables 53–61.

Blanks should not have measurable concentrations of the constituents of interest. Measurable concentrations are those that exceed the reporting levels plus twice the MPD or standard deviation. The radiochemical concentrations of blanks should not exceed two standard deviations. Because USGS 17 and USGS 97 contain natural ground waters, those equipment blank results should not exceed the known concentrations of the constituents of interest plus twice the MPD or standard deviation.

Blank Results

The blanks obtained from the RESL and the Idaho Chemical Processing Plant (ICPP) were from the distilled and deionized water systems used by the analytical laboratories. The water samples were analyzed to determine if they would be appropriate for use as blank source solutions. The blanks from the RESL had measurable concentrations of tritium; this is due to tritium in the water supply at the Central Facilities Area where the RESL is located (Mann and Cecil, 1990). Radium-226, organic carbon, and phenols also were present in a RESL water sample. The blank from the ICPP had measurable concentrations of some

Table 8. Identification, source, and description of blank samples for the water-quality monitoring program at the Idaho National Engineering Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation]

Site identifier	Date prepared	Source	Description
USGS 254 USGS 288 USGS 301 QAS-8	02/17/89 04/26/89 06/30/89 11/02/90	Radiological and Environmental Sciences Laboratory	Laboratory distilled and deionized water
QAS-1	12/01/89	Idaho Chemical Processing Plant	Laboratory distilled and deionized water
QA-7 QA-1	10/31/89 09/25/90	Grocery store	Bottled distilled water
QA-5	05/07/93	U.S. Geological Survey, Idaho Falls Field Office	Deionized water
QAS-23 QA-16	06/12/92 11/12/92	National Water Quality Laboratory	Volatile organic compound blank water

Table 9. Identification, source, and description of equipment-blank samples for the water-quality monitoring program at the Idaho National Engineering Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation]

Site identifier	Date prepared	Source	Description
QAB-1	02/21/92	OmniSolv® water	Rinsate of filtering apparatus
QA-5 QA-6 QA-15 QA-10 QA-15 QAS-30 QA-3	07/14/92 08/13/92 10/22/92 04/29/93 04/30/93 06/15/93 07/06/93	Inorganic-free water from the Quality Water Service Unit	Rinsate of sampling equipment and filtering apparatus
QA-2 QA-1 QA-13	07/06/93 07/06/93 10/15/93	Deionized water from the U.S. Geological Survey, Idaho Falls Field Office	Rinsate of sampling equipment and filtering apparatus
QA-3 QA-3 QA-8 QA-4	04/13/92 08/07/92 10/16/92 05/05/93	USGS 17	Rinsate of portable pumps
QA-2 QA-3 QA-6 QA-5	09/16/91 10/21/91 01/21/92 01/21/92	USGS 97	Rinsate of portable pumps

total recoverable trace elements, gross radioactivity and radionuclides, and organic compounds. The trace elements present were aluminum, copper, iron, lead, and zinc. Radiochemical analyses revealed the presence of gross alpha radioactivity, gross beta radioactivity, radium-226, radium-228, and tritium. Also present were bis(2-ethylhexyl) phthalate and phenols. These two sources are unsuitable for use as blank source solutions.

The two samples of bottled distilled water obtained from grocery stores were relatively free of the constituents of interest. One sample had small concentrations of sodium and chloride that were greater than the reporting level but within twice the MPD's. The other had a measurable concentration of ammonia. Radiochemical analyses indicated that no radionuclides were present. These samples were not analyzed for trace elements, gross radioactivity, or organic compounds. However, because it is difficult to ensure the purity of water from so many different sources, the use of this type of water is discouraged except in an emergency situation (D. Rickert, USGS, written commun., 1992).

The deionized water from the Idaho Falls Field Office had small concentrations of methylene chloride and toluene; these samples were not analyzed for trace elements and nutrients. The Idaho Falls Field Office is located some distance from the INEL Project Office; therefore, the distilled water is transported to the INEL in large polyethylene containers and stored until needed. It is unclear whether the small concentrations of the two volatile organic compounds were due to the water, to contact with the container, or to the shipping and storage processes.

Two VBW samples from the NWQL were analyzed, one for inorganic constituents and the other for organic compounds. This type of blank source solution is expected to be free of volatile organic compounds but not necessarily free of inorganic constituents. One blank, QAS-23, had small concentrations of sodium, chloride, and bromide; no analyses were requested for organic constituents. Methylene chloride was detected in the other sample, QA-16, which was analyzed only for volatile organic compounds.

In summary, 8 blanks were analyzed for sodium, 9 for chloride, and 11 for chromium; there were no measurable concentrations of these constituents except for sodium in one result. Three blanks were analyzed for sulfate, fluoride, bromide, and total recoverable mercury; there were no measurable concentrations of these constituents except for bromide in one result. Analytical results indicated that concentrations of ammonia in three of five blanks were greater than the reporting level; all but one were within twice the MPD. Three blanks were analyzed for total recoverable trace elements; measurable concentrations of aluminum, copper, iron and zinc were found in QAS-1. The same three blanks were analyzed for gross alpha radioactivity and gross beta radioactivity; only QAS-1 had concentrations greater than two standard deviations. Measurable concentrations of radium were detected in QAS-1 from the ICPP (radium-226 and radium-228) and QAS-8 from the RESL (radium-226). Several blanks were analyzed for other radionuclides: 2 for gamma radiation, 4 for strontium-90, 6 for tritium, and 2 for transuranics. No radioactivity greater than two standard deviations was detected except in water from the ICPP and the RESL, which had measurable concentrations of tritium. Several blanks were analyzed for organic compounds and four of them had measurable concentrations of some organic compounds. Bis(2-ethylhexyl) phthalate and phenols were in the blank from the ICPP. Total organic carbon and phenols were in the blank from the RESL. Methylene chloride was in two other blanks; also, toluene was in one of the two.

For most of the blanks, the results of ammonia analyses were greater than the reporting level but within twice the MPD. Although the statistical comparisons indicated that the results of 100 percent of the replicate pairs of samples were equivalent, the data showed that the ammonia concentrations of the blanks and the routine water-quality samples were essentially the same. The positive bias, evidenced by the number of blank results that were greater than the reporting level, may be due to either sample collection or analytical methods. The situation has been noted and documented by the BQA and is being addressed by the laboratory (A. Lutke, USGS, written commun., 1993).

Equipment-Blank Results

Several source solutions have been used for equipment blanks: commercially available OmniSolv® water; IBW from the QWSU; deionized water from the USGS Idaho Falls Field Office; and water from USGS 17 and USGS 97 at the INEL. The equipment-blank source solutions were passed through and collected from different sampling apparatus in the same manner as the routine water-quality samples. Then, the blanks were analyzed for the constituents of interest to determine if the sampling process had introduced a bias to the analytical results.

Ten equipment blanks were analyzed for sodium, 18 for chloride, and 29 for chromium. There were no measurable concentrations of these constituents except for sodium in one blank. Only one equipment blank, QAS-30, which was an IBW, was analyzed for sulfate, fluoride, bromide, and total recoverable mercury. The concentration of bromide was greater than the reporting level but was within twice the MPD. Five equipment blanks were analyzed for nutrients; except for QAS-15, all of the results for ammonia analyses were greater than the reporting level but were within twice the MPD. Analyses for QAS-15 indicated that the concentrations for all the nitrogen results were greater than the reporting levels. The blank, QAS-30, was analyzed for total recoverable iron, lead, nickel, and silver; measurable concentrations of iron and lead were detected. This same blank was analyzed for gross alpha radioactivity and gross beta radioactivity; no measurable concentrations of those constituents were detected. Nine equipment blanks were analyzed for gamma radiation, 16 for strontium-90, and 17 for tritium; no radioactivity greater than two standard deviations was detected. One equipment blank, QAB-1, was analyzed for organic compounds and only methylene chloride was detected.

Water from USGS 17 and USGS 97, which was used to prepare equipment blanks, has been analyzed over the years for sodium, chloride, chromium, and selected radioactive constituents for the water-quality monitoring program. A comparison of the results of the water from USGS 17 and USGS 97 as equipment blanks with the historical results as routine water-quality samples indicated that they were statistically equivalent except for sodium in one blank. The concentration of sodium in USGS 17 (QA-8) as an equipment blank was approximately twice that of USGS 17 as a routine water-quality sample. The means of the historical results and deviations of the means for sodium, chloride, and chromium in the water from USGS 17 and USGS 97 follow: USGS 17 had an average of 6.3±0.6 mg/L of sodium, 6.8±1.1 mg/L of chloride, and 2.4±3.4 µg/L of chromium; and USGS 97 had an average of 15±1 mg/L of sodium, 33±3 mg/L of chloride, and 6.4±1.5 µg/L of chromium. Analyses indicated that no radioactive constituents were present in these well waters.

All the analytical results for gross radioactivity and radionuclides show that none were present in the equipment blanks. There was no evidence of radioactive contamination from

the equipment used for previous water sampling or from ambient environmental conditions.

SUMMARY AND CONCLUSIONS

Water samples were collected by the USGS from 177 monitoring sites for the water-quality monitoring program at the INEL from 1989 through 1993. Several thousand analyses have been performed by the NWQL and the RESL to determine the concentrations of major ions, nutrients, trace elements, gross radioactivity and radionuclides, organic compounds, and total organic carbon in those waters. Concurrently, more than 3,000 analyses were performed on the replicate pairs of samples collected and blank samples prepared for the QA/QC program. The precision of field and laboratory methods can be assessed with the data from the analyses of the replicate pairs of samples. Although many factors may affect precision, the determination as to whether replicate pairs are equivalent, along with the BQA report concerning the NWQL (Maloney and others, 1993) and historical data, is useful in assessing sources of imprecision, bias, and, in some cases, inaccuracy.

To evaluate the precision of field and laboratory methods, analytical results of the replicate pairs of samples were tested statistically for equivalence on the basis of the precision associated with each result. Within the major ion analyses, 94 percent were equivalent; nutrients, 93 percent; trace elements, 92 percent; gross radioactivity and radionuclides, 95 percent; and organic constituents, 99 percent. In all, the statistical comparison of the data indicated that 96 percent of the replicate pairs were equivalent. The large percentage of analytical results of replicate pairs that were equivalent indicates that the samples were being collected in a manner that ensures the quality of the data.

Ninety percent or more of the analytical results for each constituent were equivalent when tested statistically except for some constituents of interest. Those constituents and the percentages of replicate pairs that were equivalent are ammonia plus organic nitrogen, 82 percent; orthophosphate, 84 percent; iron, 60 percent; manganese, 77 percent; radium-226, 55 percent; total organic carbon, 82 percent; and total phenols, 33 percent.

Lack of precision for analytical methods to determine the concentrations of iron and manganese has been documented by the BQA in the BSP. Although the statistical comparisons of the INEL replicate pairs analyzed for manganese seemed to indicate lack of precision, a closer look at the data shows that most results were below the reporting level and not enough data were available to concur with the BQA conclusion.

The BQA does not evaluate the methods used to determine radionuclides and the reason for the lack of equivalence between the replicate pairs analyzed for radium-226 could not be clearly defined. Because the analyses were done for the dissolved constituent, rather than the total recoverable constituent, and because the samples analyzed for radium-228, which were collected sequentially, were equivalent, it is unlikely that the inconsistencies were due to the sample collection process.

Neither an MPD nor a standard deviation was available for analysis of total organic carbon. The RSD of 6 percent reported in the NWQL Services Catalog (Pritt and Jones, 1989) indicated that only 29 percent of the replicate pairs were equivalent. An alternate method of determining the standard deviation, using precision data for the total organic carbon method (Wershaw and others, 1987, p. 15), indicated that 82 percent of the results were equivalent.

The statistical comparisons of the analytical results for total phenols entailed using the RSD of 12 percent reported in the NWQL Services Catalog (Pritt and Jones, 1989). The results of the test indicated that only 33 percent of the replicate pairs analyzed for total phenols were equivalent. Because of the way the data were rounded, only the results of replicate pairs that were numerically the same could be considered equivalent at an RSD of 12 percent.

Blanks are an important component of the QA/QC program. The source-solution blank is water that is free of the constituents of interest and is used as a stock solution for other blank samples. Analytical results of a source-solution blank are used to determine variability or bias at the laboratory. Furthermore, this type of blank is used to determine if, in fact, the blank solution is free of contaminants. An equipment blank that has been passed through and collected from all or part of the sampling apparatus may be used to detect bias that may have been introduced through use of that equipment. Eight percent of the analyses for inorganic constituents showed measurable concentrations were present in the blanks, nine percent for radioactive constituents, and less than one percent for organic constituents.

Several sources were used for source-solution blanks: distilled and deionized water from the ICPP and the RESL analytical laboratories, bottled distilled water from grocery stores, deionized water from the Idaho Falls Field Office, and VBW from the NWQL. The blank samples obtained from the ICPP and the RESL were unsuitable for use as blank source solutions because they had measurable concentrations of constituents of interest. Tritium was a particularly unacceptable contaminant because it is part of the water molecule and cannot be removed. Distilled water from grocery stores may be used only in an emergency situation. The deionized water from the Idaho Falls Field Office was suitable for use as blank source solutions.

Additionally, the following sources were used for equipment blanks: commercially available OmniSolv® water; IBW from the QWSU; deionized water from the Idaho Falls Field Office; and well water from USGS 17 and USGS 97 at the INEL. Two equipment blanks had measurable concentrations of sodium. There was no evidence of radioactive contamination from the equipment used for previous water sampling or from ambient environmental conditions; all the analytical results for gross radioactivity and radionuclides showed none were detected in the equipment blanks.

Although statistical comparisons indicated that the results of replicate pairs analyzed for ammonia were 100 percent equivalent, most of the blank results were greater than the reporting level. The blank results were comparable to the routine water-quality sample results; that shows that there is a positive bias, which may be due to either sample collection or analytical methods.

Evaluation of the QA/QC data, the BQA report (Maloney and others, 1993), and historical data help to assess precision and bias of field methods at the INEL Project Office. The large percentage of replicate pairs of samples that are equivalent and of blank results that are free of the constituents of interest validates the methods and procedures and supports the reliability of the data. Furthermore, the QA/QC data are useful in determining the source of inconsistencies when lack of equivalence between replicate pairs or blanks with measurable concentrations of the constituents of interest are detected. For example, when results of a specific analysis for several replicate pairs are not equivalent, and the results for other analyses of those pairs are equivalent, the source of the inconsistencies

may be the laboratory proce-dures. On the other hand, when results of all the analyses for a replicate pair are not equivalent, the source of the inconsistencies may be the field procedures. In general, replicate samples do not address accuracy; but, a large Z-value, when the results of two replicate samples are tested statistically for equivalence, suggests that at least one of the samples is inaccurate.

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SUPPLEMENTAL INFORMATION SECTION

Table 10. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for sodium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement. Symbols: #, the analysis was performed by the Radiological and Environmental Sciences Laboratory; *, the samples were analyzed for total recoverable sodium, rather than dissolved sodium; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Sodium (mg/L)	Sodium QA (mg/L)	Z-value	Remark
Area II	7/14/93	17	15	1.70	
Cerro Grande	10/18/9	15	15	.00	
CFA-2	7/25/91	18	18	.00	
CPP 1	11/06/89	7.9	7.7	.28	
	10/31/90	8.0	7.8	.28	
CPP 2	1/31/89	#6±2	#5±2	.35	
	4/29/92	7.6	7.9	.42	
CPP 4	7/23/90	7.8	7.6	.28	
CWP-4	4/25/89	#13±2	#16±2	.35	
EBR I	4/28/89	#7±2	#7±2	.00	
Fire Station 2	10/08/92	8.5	8.6	.13	
MTR Test	10/07/92	23	23	.00	
NRF-1	9/09/91	*15	*14	.92	
NRF-2	3/21/90	*17	*17	.00	
	3/05/91	*20	*19	.73	
	9/15/93	*19	*19	.00	
NRF-3	6/17/91	*13	*13	.00	
	12/03/92	*14	*14	.00	
NRF-4	2/07/91	*14	*16	1.79	
	4/07/93	*17	*18	.79	
NRF-6	3/10/92	*81	*82	.20	
NRF-7	1/08/92	*8.1	*8.4	.41	
OMRE	4/28/89	7.0	7.0	.00	
PW-1	10/27/89	150	150	.00	
PW-2	10/25/93	180	180	.00	
PW-4	10/17/90	190	180	.93	
	10/22/92	170	170	.00	
PW-5	10/17/91	160	160	.00	
RWMC Prod.	10/30/90	7.9	8.2	.41	
Site 9	9/27/91	12	12	.00	
Site 14	10/18/91	15	15	.00	
	11/04/93	15	12	2.90	N
Site 19	10/01/90	8.3	8.4	.13	
SPERT-1	4/28/89	#15 ±2	#14±2	.35	

Table 10. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for sodium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Sodium (mg/L)	Sodium QA (mg/L)	Z-value	Remark
TRA Disp.	10/11/90	11	11	0.00	
TRA 3	4/27/89	#7±2	#7±2	.00	
	11/02/92	9.0	9.0	.00	
TRA 4	11/13/89	6.9	7.7	1.17	
	10/30/91	7.6	7.9	.42	
WSINEL1	12/07/90	*18	*18	.00	
	12/03/91	*15	*15	.00	
USGS 1	7/20/92	16	15	.87	
USGS 12	6/15/90	*13	*13	.00	
	9/06/91	*13	*14	.97	
	11/05/93	*16	*16	.00	
USGS 15	8/06/90	*18	*19	.76	
	3/12/92	*5.7	*8.7	4.40	N
USGS 17	3/13/91	*5.6	*5.4	.34	
	6/11/93	*5.6	*5.8	.34	
USGS 19	10/01/92	12	12	.00	
USGS 22	9/30/93	21	21	.00	
USGS 23	7/09/93	8.7	9.4	.90	
USGS 32	7/06/92	18	18	.00	
USGS 35	10/07/91	12	13	1.09	
	10/20/93	12	⊗12	.00	
USGS 37	10/21/93	45	45	.00	
USGS 38	10/14/92	60	61	.27	
USGS 40	10/18/89	12	12	.00	
USGS 44	10/26/90	8.6	8.5	.13	
	11/01/93	8.8	8.4	.53	
USGS 46	10/09/91	11	10	1.16	
USGS 54	11/03/89	17	18	.79	
	10/16/92	12	11	1.09	
	10/13/93	12	11	1.09	
USGS 56	11/15/89	16	16	.00	
USGS 57	12/22/89	29	28	.53	
	10/29/90	38	37	.42	
USGS 58	10/21/93	9.9	34	14.54	N
USGS 59	4/17/89	#10±2	#10±2	.00	
	10/25/93	23	23	.00	
USGS 61	9/27/90	15	14	.92	
USGS 62	10/13/92	15	14	.92	

Table 10. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for sodium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Sodium (mg/L)	Sodium QA (mg/L)	Z-value	Remark
USGS 65	10/15/91	13	13	0.00	
USGS 68	4/27/89	#1,000±100	#1,000±100	.00	
USGS 69	10/24/91	10	10	.00	
USGS 71	10/12/93	12	12	.00	
USGS 72	10/28/93	34	15	1.92	N
USGS 76	10/17/90	9.4	9.0	.51	
	10/21/93	9.5	⊗9.2	.38	
USGS 77	10/09/92	32	32	.00	
USGS 83	10/11/90	9.9	9.9	.00	
USGS 84	10/09/92	9.4	9.4	.00	
USGS 89	10/16/91	19	19	.00	
USGS 90	10/04/93	11	8.0	3.70	N
USGS 97	6/07/90	*15	*14	.92	
	12/07/90	*13	*14	.97	
	6/07/91	*15	*13	1.88	
	11/04/93	*15	*15	.00	
USGS 98	7/30/90	*8.1	*8.0	.14	
	9/21/92	*8.6	*11	2.91	N
USGS 99	10/03/90	*12	*11	1.09	
	6/16/92	*12	*12	.00	
USGS 100	10/05/92	16	16	.00	
USGS 102	12/10/90	*13	*14	.97	
	12/09/92	*13	*13	.00	
USGS 104	10/16/89	8.3	8.2	.14	
	9/29/92	8.5	8.6	.143	
USGS 105	10/25/89	12	13	1.02	
USGS 109	10/01/93	11	11	.00	
USGS 110	10/11/89	16	16	.00	
USGS 114	10/05/89	23	23	.00	
	9/24/90	22	22	.00	
	10/21/91	22	21	.67	
USGS 116	10/05/89	28	28	.00	
USGS 122	10/15/91	33	34	.46	

Table 11. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for sulfate by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Sulfate (mg/L)	Sulfate QA (mg/L)	Z-value	Remark
Cerro Grande	10/18/90	18	18	0.00	
CPP 1	10/31/90	27	27	.00	
NRF-1	9/09/91	36	39	.74	
NRF-2	3/21/90	52	51	.20	
	3/05/91	52	53	.20	
	9/15/93	51	53	.41	
NRF-3	6/17/91	38	38	.00	
	12/03/92	41	41	.00	
NRF-4	2/07/91	45	38	1.62	
	4/07/93	46	46	.00	
NRF-6	3/10/92	230	220	.66	
NRF-7	1/08/92	19	19	.00	
PW-2	1/08/91	35	35	.00	
PW-4	10/17/90	25	29	1.16	
RWMC Prod.	10/30/90	26	29	.86	
Site 19	10/01/90	25	24	.30	
TRA Disp.	10/11/90	40	45	1.15	
WSINEL1	12/07/90	53	53	.00	
	12/03/91	61	55	1.13	
USGS 12	6/15/90	32	30	.54	
	09/06/91	29	32	.82	
	11/05/93	35	36	.28	
USGS 15	8/06/90	31	30	.27	
	3/12/92	18	19	.34	
USGS 17	3/13/91	19	18	.34	
	6/11/93	19	19	.00	
USGS 19	10/12/90	25	25	.00	
USGS 44	10/26/90	24	23	.31	
USGS 54	1/14/91	280	280	.00	
USGS 57	10/29/90	32	33	.27	
USGS 61	9/27/90	150	140	.96	
USGS 76	10/17/90	26	26	.00	
USGS 83	10/11/90	23	21	.64	
USGS 97	6/07/90	34	34	.00	
	12/07/90	36	37	.25	

Table 11. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for sulfate by the National Water Quality Laboratory—continued

Site identifier	Date sampled	Sulfate (mg/L)	Sulfate QA (mg/L)	Z-value	Remark
USGS 97 - cont.	6/07/91	27	33	1.66	
	11/04/93	36	36	.00	
USGS 98	7/30/90	22	23	.31	
	9/21/92	23	21	.64	
USGS 99	10/03/90	23	23	.00	
	6/16/92	27	26	.29	
USGS 100	1/07/91	17	17	.00	
USGS 102	12/10/90	160	33	15.02	N
	12/09/92	36	36	.00	
USGS 104	1/10/91	22	22	.00	

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement. Symbol: #, the analysis was performed by the Radiological and Environmental Sciences Laboratory; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
ARBOR Test	10/01/91	15	17	1.40	
Area II	7/14/93	17	16	.69	
Badging Facility	4/19/90	18	17	.66	
Big Lost River	10/09/91	4.6	4.5	.12	
Birch Creek	4/05/90	4.6	4.7	.12	
Cerro Grande	10/18/90	22	21	.58	
CFA-2	7/25/91	91	91	.00	
CPP 1	11/06/89	14	15	.74	
	10/31/90	17	18	.66	
CPP 2	1/31/89	#18±2	#18±2	.00	
	7/26/89	#16±2	#15±2	.35	
	4/29/92	18	18	.00	
CPP 4	7/23/90	16	17	.69	
CWP-4	4/25/89	#15±2	#16±2	.35	
	4/17/91	20	20	.00	
CWP-5	10/14/93	11	11	.00	
EBR I	4/28/89	#7±2	#7±2	.00	
	4/19/90	7.8	7.5	.31	
	4/08/93	6.6	6.4	.22	
Fire Station 2	4/18/91	15	19	2.70	N
	10/08/92	16	16	.00	
MTR Test	10/07/92	16	16	.00	
NRF-1	9/09/91	31	31	.00	
NRF-2	3/21/90	45	45	.00	
	3/05/91	54	55	.29	
	9/15/93	47	48	.32	
NRF-3	6/17/91	36	36	.00	
	12/03/92	35	36	.40	
NRF-4	2/07/91	41	40	.36	
	4/07/93	43	45	.68	
NRF-6	3/10/92	200	190	.91	
NRF-7	1/08/92	6.5	6.5	.00	
OMRE	4/28/89	18	18	.00	
PW-1	4/24/89	#250±30	#250±30	.00	

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
PW-1 - cont.	10/27/89	#260±30	#250±30	0.24	
	7/03/90	310	310	.00	
PW-2	1/08/91	260	260	.00	
	10/25/93	290	320	1.77	
PW-3	3/30/90	230	230	.00	
PW-4	2/02/90	250	250	.00	
	10/17/90	300	300	.00	
	4/29/91	280	280	.00	
	10/22/92	290	290	.00	
PW-5	10/17/91	260	260	.00	
PW-8	4/05/91	22	22	.00	
	7/17/93	12	11	.84	
PW-9	2/04/93	27	26	.50	
	4/06/93	25	25	.00	
P&W2	4/18/89	#18±2	#17±2	.35	
	3/14/90	25	26	.52	
RWMC Prod.	10/30/90	13	16	2.23	N
Site 9	9/27/91	12	14	1.58	
Site 14	10/18/91	9.3	9.3	.00	
	11/04/93	8.5	8.5	.00	
Site 19	10/01/90	15	14	.74	
	4/07/92	15	13	1.52	
SPERT-1	4/28/89	#28±3	#28±3	.00	
TRA Disp.	1/18/90	11	11	.00	
	10/11/90	10	13	2.53	N
TRA 3	4/27/89	#12±2	#12±2	.00	
	4/10/92	12	15	2.32	N
	11/02/92	11	11	.00	
TRA 4	11/13/89	11	11	.00	
	4/25/91	9.0	11	1.81	
	10/30/91	11	14	2.42	N
	4/05/93	10	10	.00	
WSINEL1	12/07/90	110	110	.00	
	12/03/91	110	100	1.61	
USGS 1	7/20/92	12	11	.84	
USGS 8	4/03/91	10	9.8	.18	
USGS 11	10/08/91	16	16	.00	
USGS 12	6/15/90	31	30	.45	

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
USGS 12 -cont.	9/06/91	29	30	0.46	
	11/05/93	37	33	1.63	
USGS 14	10/01/92	22	22	.00	
	4/16/93	20	20	.00	
USGS 15	8/06/90	31	31	.00	
	3/12/92	8.1	8.1	.00	
USGS 17	3/13/91	7.1	6.9	.21	
	6/11/93	5.9	5.9	.00	
USGS 19	10/12/90	13	12	.81	
	10/01/92	13	14	.77	
USGS 20	4/08/91	24	25	.53	
USGS 22	4/23/91	72	65	1.65	
	9/30/93	60	60	.00	
USGS 23	7/09/93	9.2	9.8	.56	
USGS 27	4/27/90	67	63	.99	
USGS 32	7/06/92	45	44	.34	
USGS 34	4/01/91	18	18	.00	
USGS 35	10/07/91	27	22	2.65	N
	4/14/93	25	24	6.53	
	10/20/93	21	⊗22	.58	
USGS 37	1/02/90	74	74	.00	
	4/18/90	66	67	.24	
	10/21/93	140	150	1.20	
USGS 38	4/23/92	140	150	1.20	
	10/14/92	170	160	1.06	
USGS 40	10/18/89	23	23	.00	
	10/18/89	27	23	2.09	N
	4/25/91	35	30	2.16	N
USGS 43	4/13/90	27	27	.00	
USGS 44	10/26/90	20	20	.00	
	11/01/93	20	19	.62	
USGS 45	4/20/92	23	19	2.36	N
USGS 46	10/09/91	24	27	1.55	
USGS 47	4/10/91	28	26	.99	
USGS 52	4/03/90	25	25	.00	
USGS 54	7/07/89	#21±2	#22±2	.35	
	11/03/89	19	19	.00	
	1/14/91	29	25	1.98	N

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
USGS 54 - cont.	10/16/92	9.4	9.2	0.19	
	4/19/93	12	12	.00	
	7/22/93	12	⊗12	.00	
	10/13/93	11	12	.84	
USGS 56	11/15/89	12	12	.00	
USGS 57	12/22/89	67	67	.00	
	6/28/90	78	85	1.41	
	10/29/90	85	88	.58	
	7/21/93	180	⊗160	2.06	N
USGS 58	4/03/91	12	11	.84	
	10/21/93	11	11	.00	
USGS 59	4/17/89	#23±2	#29±3	1.66	
	4/28/92	56	56	.00	
	4/22/93	160	160	.00	
	10/25/93	44	43	.34	
USGS 60	1/10/92	110	17	19.80	N
USGS 61	9/27/90	19	17	1.30	
USGS 62	4/09/92	23	23	.00	
	10/13/92	14	14	.00	
USGS 63	4/10/90	22	22	.00	
USGS 65	10/15/91	22	22	.00	
USGS 66	4/29/92	23	24	.55	
USGS 68	4/27/89	#33±3	#33±3	.00	
	7/02/91	47	44	1.00	
	1/17/92	52	58	1.70	
USGS 69	10/24/91	22	22	.00	
USGS 71	4/22/91	20	21	.60	
	10/12/93	19	18	.64	
USGS 72	10/28/93	16	16	.00	
USGS 76	1/05/90	11	11	.00	
	10/17/90	13	13	.00	
	4/26/93	12	12	.00	
	10/21/93	11	⊗11	.00	
USGS 77	10/09/92	120	120	.00	
USGS 82	7/07/93	16	16	.00	
	4/15/92	20	20	.00	
USGS 83	10/11/90	13	12	.81	
	4/06/92	16	17	.69	

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
USGS 84	10/09/92	12	12	0.00	
USGS 85	4/26/90	53	53	.00	
	4/19/93	67	63	.99	
USGS 86	4/21/89	#23±2	#23±2	.00	
	10/13/93	19	20	.62	
USGS 87	4/21/92	16	21	3.19	N
USGS 88	7/12/89	#100±10	#100±10	.00	
	7/16/91	85	87	.39	
	1/20/93	89	91	.37	
USGS 89	1/04/89	#46±5	#46±5	.00	
	10/16/91	42	42	.00	
	1/17/92	42	42	.00	
USGS 90	1/18/89	#20±2	#18±2	.71	
	1/23/90	13	13	.00	
	1/16/92	13	13	.00	
	4/20/92	17	16	.69	
	10/04/93	12	13	.81	
USGS 97	6/07/90	31	34	1.30	
	12/07/90	32	33	.43	
	6/07/91	29	28	.48	
	11/04/93	32	32	.00	
USGS 98	7/30/90	18	18	.00	
	9/21/92	17	18	.66	
USGS 99	10/03/90	19	19	.00	
	6/16/92	20	20	.00	
USGS 100	1/07/91	19	19	.00	
	10/05/92	18	18	.00	
	4/23/93	16	17	.69	
USGS 102	12/10/90	28	30	.94	
	12/09/92	31	31	.00	
USGS 103	7/16/93	15	15	.00	
USGS 104	10/16/89	10	11	.88	
	7/09/90	13	12	.81	
	1/10/91	15	15	.00	
	9/29/92	12	12	.00	
USGS 105	10/25/89	13	13	.00	
USGS 106	4/02/90	12	15	2.32	N
USGS 106	4/02/92	15	15	.00	

Table 12. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chloride by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chloride (mg/L)	Chloride QA (mg/L)	Z-value	Remark
USGS 107	4/22/91	23	21	1.14	
	4/21/93	20	20	.00	
USGS 109	10/01/93	13	14	.77	
USGS 110	4/12/89	#18±2	#18±2	.00	
	10/11/89	#22±2	#21±2	.62	
USGS 111	3/20/90	110	110	.00	
USGS 113	7/15/91	180	200	1.85	
USGS 114	10/05/89	81	81	.00	
	9/24/90	81	81	.00	
	10/21/91	87	88	.19	
USGS 115	7/16/93	33	32	.43	
USGS 116	4/06/89	#71±2	#70±2	.10	
	10/05/89	68	68	.00	
USGS 117	4/18/91	15	17	1.40	
USGS 119	4/03/89	#10 ±2	#10±2	.00	
	6/28/89	#12±2	#12±2	.00	
	4/09/90	8.8	8.8	.00	
	7/09/92	9.1	1.0	9.37	N
USGS 120	7/19/90	27	26	.53	
USGS 122	10/15/91	71	74	.67	
	4/15/92	83	85	.39	

Table 13. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for fluoride by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement. Symbol: <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Fluoride (mg/L)	Fluoride QA (mg/L)	Z-value	Remark
Cerro Grande	10/18/90	0.3	0.3	0.00	
CPP 1	10/31/90	.3	.3	.00	
NRF-1	9/09/91	.2	.2	.00	
NRF-2	3/21/90	<.1	<.1	0	
	3/05/91	.2	.1	.94	
	9/15/93	.2	.2	.00	
NRF-3	6/17/91	.2	.2	.00	
	12/03/92	.1	.1	.00	
NRF-4	2/07/91	.1	.2	.94	
	4/07/93	.2	.2	.00	
NRF-6	3/10/92	.2	.2	.00	
NRF-7	1/08/92	.3	.3	.00	
PW-2	1/08/91	.4	.3	.94	
PW-4	10/17/90	.2	.2	.00	
RWMC Prod.	10/30/90	.2	.3	.94	
Site 19	10/01/90	.1	.2	.94	
TRA Disp.	10/11/90	<.1	<.1	0	
WSINEL1	12/07/90	.1	.1	.00	
	12/03/91	.2	.2	.00	
USGS 12	6/15/90	<.1	.1	0	
	9/06/91	.2	.2	.00	
	11/05/93	.2	.2	.00	
USGS 15	8/06/90	.4	.4	.00	
	3/12/92	.1	.2	.94	
USGS 17	3/13/91	.2	.2	.00	
	6/11/93	.2	.2	.00	
USGS 19	10/12/90	<.1	<.1	0	
USGS 44	10/26/90	<.1	<.1	0	
USGS 54	1/14/91	.4	.3	.94	
USGS 57	10/29/90	.4	.4	.00	
USGS 61	9/27/90	<.1	.2	.94	
USGS 76	10/17/90	<.1	<.1	0	
USGS 83	10/11/90	.2	.1	.94	
USGS 97	6/07/90	<.1	.4	2.83	N
	12/07/90	.1	.1	.00	

Table 13. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for fluoride by the National Water Quality Laboratory —continued

Site identifier	Date sampled	Fluoride (mg/L)	Fluoride QA (mg/L)	Z-value	Remark
USGS 97 - cont.	6/07/91	.2	.2	0.00	
	11/04/93	.2	.2	.00	
USGS 98	7/30/90	.4	.7	2.83	N
	9/21/92	.2	.3	.94	
USGS 99	10/03/90	<.1	<.1	0	
	6/16/92	.2	.2	.00	
USGS 100	1/07/91	.7	.7	.00	
USGS 102	12/10/90	.2	.1	.94	
	12/09/92	.2	.2	.00	
USGS 104	1/10/91	.2	.2	.00	

Table 14. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for bromide by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites; QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Bromide (mg/L)	Bromide QA (mg/L)	Z-value	Remark
NRF-1	9/09/91	0.07	0.08	0.63	
NRF-2	3/21/90	.07	.06	.72	
	3/05/91	.06	.07	.72	
	9/15/93	.07	.07	.00	
NRF-3	6/17/91	.07	.07	.00	
	12/03/92	.08	.07	.63	
NRF-4	2/07/91	.06	.07	.72	
	4/07/93	.09	.09	.00	
NRF-6	3/10/92	.08	.08	.00	
NRF-7	1/08/92	.02	.03	1.85	
WSINEL1	12/07/90	.29	.29	.00	
	12/03/91	.31	.31	.00	
USGS 12	6/15/90	.06	.06	.00	
	9/06/91	.08	.08	.00	
	11/05/93	.08	.08	.00	
USGS 15	8/06/90	.07	.07	.00	
	3/12/92	.02	.01	2.98	N
USGS 17	3/13/91	.02	.02	.00	
	6/11/93	.03	.03	.00	
USGS 97	6/07/90	.06	.06	.00	
	12/07/90	.06	.06	.00	
	6/07/91	.08	.08	.00	
	11/04/93	.07	.08	.63	
USGS 98	7/30/90	.04	.04	.00	
	9/21/92	.05	.05	.00	
USGS 99	10/03/90	.05	.05	.00	
	6/16/92	.05	.05	.00	
USGS 102	12/10/90	.06	.05	.85	
	12/09/92	.07	.07	.00	

Table 15. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved nitrite, as nitrogen, by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; U, statistical agreement of the analytical result is uncertain. Symbols: <, the result was less than the indicated reporting level; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Dissolved nitrite, as nitrogen (mg/L)	Dissolved nitrite, as nitrogen, QA (mg/L)	Z-value	Remarks
Area II	7/14/93	<0.01	<0.01	0	
CPP 1	11/06/89	<.01	<.01	0	
	10/31/90	<.01	<.01	0	
Fire Station 2	10/08/92	<.01	<.01	0	
MTR Test	10/07/92	<.01	<.01	0	
NRF-1	9/09/91	<.01	.01		U
NRF-2	3/21/90	<.01	<.01	0	
	3/05/91	<.01	<.01	0	
	9/15/93	<.01	<.01	0	
NRF-3	6/17/93	<.01	<.01	0	
	12/03/92	<.01	<.01	0	
NRF-4	2/07/91	<.01	<.01	0	
	4/07/93	<.01	<.01	0	
NRF-6	3/10/92	<.01	<.01	0	
NRF-7	1/08/92	<.01	<.01	0	
PW-1	10/27/89	<.01	<.01	0	
RWMC Prod.	10/30/90	<.01	<.01	0	
Site 9	9/27/91	<.01	<.01	0	
Site 14	11/04/93	<.01	<.01	0	
TRA Disp.	10/11/90	<.01	<.01	0	
WSINEL1	12/07/90	<.01	<.01	0	
	12/03/91	<.01	<.01	0	
USGS 1	7/20/92	<.01	<.01	0	
USGS 12	9/06/91	<.01	<.01	0	
	11/05/93	<.01	<.01	0	
USGS 15	8/06/90	<.01	<.01	0	
	3/12/92	<.01	<.01	0	
USGS 17	3/13/91	.02	.02	.00	
	6/11/93	<.01	<.01	0	
USGS 19	10/01/92	<.01	<.01	0	
USGS 23	7/09/93	<.01	<.01	0	
USGS 32	7/06/92	<.01	<.01	0	
USGS 35	10/07/91	.01	.01	.00	

Table 15. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved nitrite, as nitrogen, by the National Water Quality Laboratory—continued

Site identifier	Date sampled	Dissolved nitrite, as nitrogen (mg/L)	Dissolved nitrite, as nitrogen, QA (mg/L)	Z-value	Remarks
	10/20/93	<.01	⊗<.01	0	
USGS 37	10/21/93	<.01	<.01	0	
USGS 38	10/14/92	<.01	<.01	0	
USGS 40	10/18/89	<.01	<.01	0	
USGS 44	10/26/90	<.01	<.01	0	
	11/01/93	<.01	<.01	0	
USGS 46	10/09/91	.01	.01	.00	
USGS 57	12/22/89	<.01	<.01	0	
	10/29/90	<.01	<.01	0	
USGS 58	10/21/93	<.01	<.01	0	
USGS 59	10/25/93	<.01	<.01	0	
USGS 65	10/15/91	<.01	<.01	0	
USGS 76	10/17/90	<.01	<.01	0	
	10/21/93	<.01	⊗<.01	0	
USGS 77	10/09/92	<.01	<.01	0	
USGS 83	10/11/90	<.01	<.01	0	
USGS 89	10/16/91	<.01	<.01	0	
USGS 90	10/04/93	<.01	<.01	0	
USGS 97	6/07/90	<.01	<.01	0	
USGS 102	12/10/90	<.01	<.01	0	
	12/09/92	.02	.02	.00	
USGS 104	10/16/89	<.01	<.01	0	
	9/29/92	<.01	<.01	0	
USGS 114	10/05/89	<.01	<.01	0	
	9/24/90	<.01	<.01	0	
	10/21/91	<.01	<.01	0	
USGS 116	10/05/89	<.01	.01		U
USGS 122	10/15/91	<.01	<.01	0	

Table 16. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved nitrite plus nitrate, as nitrogen, by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement. Symbol: ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Dissolved nitrite plus nitrate, as nitrogen (mg/L)	Dissolved nitrite plus nitrate, as nitrogen, QA (mg/L)	Z-value	Remark
Area II	7/14/93	1.1	1.1	0.00	
CPP 1	11/06/89	.83	.81	.17	
	10/31/90	.9	1.0	.77	
Fire Station 2	10/08/92	1.1	1.2	.70	
MTR Test	10/07/92	1.3	1.3	.00	
NRF-1	9/09/91	1.7	1.6	.56	
NRF-2	3/21/90	1.9	1.8	.51	
	3/05/91	1.9	1.9	.00	
	9/15/93	2.0	2.0	.00	
NRF-3	6/17/91	1.8	1.8	.00	
	12/03/92	1.9	1.9	.00	
NRF-4	2/07/91	1.8	1.8	.00	
	4/07/93	2.0	2.0	.00	
NRF-6	3/10/92	1.7	1.7	.00	
NRF-7	1/08/92	.39	.38	.11	
PW-1	10/27/89	1.9	1.9	.00	
RWMC Prod.	10/30/90	.70	.70	.00	
Site 9	9/27/91	.64	.64	.00	
Site 14	11/04/93	.59	.64	.48	
TRA Disp.	10/11/90	1.1	1.2	.70	
WSINEL1	12/07/90	5.1	5.0	.24	
	12/03/91	5.1	5.4	.68	
USGS 1	7/20/92	.86	.84	.16	
USGS 12	9/06/91	1.8	1.7	.53	
	11/05/93	2.0	2.0	.00	
USGS 15	8/06/90	1.8	16	16.33	N
	3/12/92	.30	.34	.48	
USGS 17	3/13/91	.34	.31	.36	
	6/11/93	.35	.34	.12	
USGS 19	10/01/92	1.1	1.1	.00	
USGS 23	7/09/93	.69	.66	.27	
USGS 32	7/06/92	1.3	1.3	.00	
USGS 35	10/07/91	1.4	1.5	.60	

Table 16. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved nitrite plus nitrate, as nitrogen, by the National Water Quality Laboratory —continued

Site identifier	Date sampled	Dissolved nitrite plus nitrate, as nitrogen (mg/L)	Dissolved nitrite plus nitrate, as nitrogen, QA (mg/L)	Z-value	Remark
USGS 35 - cont.	10/20/93	1.5	⊗1.2	1.89	
USGS 37	10/21/93	3.1	3.1	.00	
USGS 38	10/14/92	3.5	3.4	.32	
USGS 40	10/18/89	3.4	3.4	.00	
USGS 44	10/26/90	1.1	1.1	.00	
	11/01/93	1.2	1.2	.00	
USGS 46	10/09/91	2.5	2.5	.00	
USGS 57	12/22/89	3.4	3.4	.00	
	10/29/90	3.5	3.5	.00	
USGS 58	10/21/93	1.2	1.2	.00	
USGS 59	10/25/93	1.4	1.5	.60	
USGS 65	10/15/91	1.5	1.5	.00	
USGS 76	10/17/90	1.1	1.1	.00	
	10/21/93	1.1	⊗1.4	1.98	N
USGS 77	10/09/92	4.9	4.9	.00	
USGS 83	10/11/90	.80	.70	1.40	
USGS 89	10/16/91	1.8	1.8	.00	
USGS 90	10/04/93	.97	.71	2.24	N
USGS 97	6/07/90	1.8	1.8	.00	
	12/07/90	1.8	1.8	.00	
	6/07/91	1.9	2.0	.50	
	11/04/93	2.0	2.0	.00	
USGS 98	7/30/90	1.1	1.1	.00	
	9/21/92	1.0	1.0	.00	
USGS 99	10/03/90	1.5	1.5	.00	
	6/16/92	1.5	1.5	.00	
USGS 102	12/10/90	1.7	1.7	.00	
	12/09/92	1.9	1.9	.00	
USGS 104	10/16/89	.66	.65	.09	
	9/29/92	.72	.72	.00	
USGS 114	10/05/89	4.0	4.1	.28	
	9/24/90	3.9	3.9	.00	
	10/21/91	4.0	3.9	.29	
USGS 116	10/05/89	3.1	3.1	.00	
USGS 122	10/15/91	2.9	2.9	.00	

Table 17. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved ammonia plus organic nitrogen, as nitrogen, by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites; QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; U, statistical agreement of the analytical result is uncertain; N, the analytical results are not in statistical agreement. Symbol: <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Dissolved ammonia plus organic nitrogen, as nitrogen (mg/L)	Dissolved ammonia plus organic nitrogen, as nitrogen QA (mg/L)	Z-value	Remark
NRF-1	9/09/91	0.3	0.3	0.00	
NRF-2	3/05/91	<.2	.3		U
NRF-3	6/17/91	.2	.4	1.37	
NRF-4	2/07/91	1.1	.5	2.40	N
WSINEL1	12/07/90	.3	.4	.65	
USGS 12	9/06/91	.3	.2	.74	
USGS 17	3/13/91	<.2	<.2	0	
USGS 97	12/07/90	<.2	<.2	0	
	6/07/91	.2	.2	.00	
USGS 99	10/03/90	.3	.5	1.21	
USGS 102	12/10/90	.2	<.2	.00	

Table 18. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved ammonia, as nitrogen, by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: mg/L, milligram per liter. Symbols: <, the result was less than the indicated reporting level; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Dissolved ammonia, as nitrogen (mg/L)	Dissolved ammonia, as nitrogen QA (mg/L)	Z-value	Remarks
Area II	7/14/93	0.02	0.02	0.00	
CPP 1	11/06/89	.03	.03	.00	
	10/31/90	<.01	.02	.42	
Fire Station 2	10/08/92	.01	.01	.00	
MTR Test	10/07/92	.01	.01	.00	
NRF-2	9/15/93	.02	.02	.00	
NRF-3	12/03/92	<.01	<.01	0	
NRF-4	2/07/91	.01	.02	.42	
	4/07/93	<.01	<.01	0	
NRF-6	3/10/92	.02	.02	.00	
NRF-7	1/08/92	<.01	<.01	0	
PW-1	10/27/89	.03	.02	.30	
RWMC Prod.	10/30/90	<.01	<.01	0	
Site 9	9/27/91	.01	.03	.82	
Site 14	11/04/93	.01	.02	.42	
TRA Disp.	10/11/90	<.01	<.01	0	
WSINEL1	12/07/90	.02	.02	.00	
	12/03/91	.02	.02	.00	
USGS 1	7/20/92	<.01	.01	0	
USGS 12	11/05/93	.02	.02	.00	
USGS 15	3/12/92	<.01	.04	1.20	
USGS 17	6/11/93	.02	.02	.00	
USGS 19	10/01/92	<.01	<.01	0	
USGS 23	7/09/93	.02	.02	.00	
USGS 32	7/06/92	.03	.02	.42	
USGS 35	10/07/91	<.01	<.01	0	
	10/20/93	.02	⊗<.01	.42	
USGS 37	10/21/93	<.01	<.01	0	
USGS 38	10/14/92	.03	.02	.42	
USGS 40	10/18/89	.01	<.01	0	
USGS 44	10/26/90	<.01	.01	.46	
	11/01/93	.02	.02	.00	
USGS 46	10/09/91	<.01	<.01	0	

Table 18. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for dissolved ammonia, as nitrogen, by the National Water Quality Laboratory —continued

Site identifier	Date sampled	Dissolved ammonia, as nitrogen (mg/L)	Dissolved ammonia, as nitrogen QA (mg/L)	Z-value	Remarks
USGS 57	12/22/89	0.02	0.02	0.00	
	10/29/90	.11	.11	.00	
USGS 58	10/21/93	<.01	<.01	0	
USGS 59	10/25/93	.02	.02	.00	
USGS 65	10/15/91	<.01	<.01	0	
USGS 76	10/17/90	.01	<.01	0	
	10/21/93	<.01	⊗<.01	0	
USGS 77	10/09/92	.01	.02	.44	
USGS 83	10/11/90	<.01	<.01	0	
USGS 89	10/16/91	<.01	<.01	0	
USGS 90	10/04/93	.01	.01	.00	
USGS 97	12/07/90	<.01	.01	0	
	6/07/91	<.01	<.01	0	
	11/04/93	.01	.02	.44	
USGS 98	9/21/92	<.01	.02	.42	
USGS 99	10/03/90	<.01	<.01	0	
	6/16/92	.02	.01	.44	
USGS 102	12/10/90	<.01	<.01	0	
	12/09/92	<.01	<.01	0	
USGS 104	10/16/89	<.01	<.01	0	
	9/29/92	<.01	<.01	0	
USGS 114	10/05/89	.03	.01	.86	
	9/24/90	<.01	<.01	0	
	10/21/91	.02	.02	.00	
USGS 116	10/05/89	.02	.02	.00	
USGS 122	10/15/91	<.01	<.01	0	

Table 19. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for orthophosphate, as dissolved phosphorus by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; U, statistical agreement of the analytical result is uncertain; N, the analytical results are not in statistical agreement. Symbols: <, the result was less than the indicated reporting level; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Orthophosphate, as dissolved phosphorus (mg/L)	Orthophosphate, as dissolved phosphorus QA (mg/L)	Z-value	Remark
Area II	7/14/93	<0.01	<0.01	0.00	
CPP 1	11/06/89	.03	.04	1.40	
	10/31/90	.03	<.01		U
Fire Station 2	10/08/92	.02	.02	.00	
MTR Test	10/07/92	.01	.01	.00	
NRF-1	9/09/91	<.01	<.01	0	
NRF-2	3/05/91	.02	.02	.00	
	9/15/93	.03	.02	1.59	
NRF-3	6/17/91	.03	.02	1.59	
	12/03/92	.02	.02	.00	
NRF-4	2/07/91	.02	.04	2.96	N
	4/07/93	.02	.02	.00	
NRF-6	3/10/92	.07	.07	.00	
NRF-7	1/08/92	.02	.01	1.82	
PW-1	10/27/89	.07	.08	.82	
RWMC Prod.	10/30/90	<.01	<.01	0	
Site 9	9/27/91	.02	.03	1.59	
Site 14	11/04/93	.02	.03	1.59	
TRA Disp.	10/11/90	.04	.08	4.17	N
WSINEL1	12/07/90	.01	.01	.00	
	12/03/91	.01	.01	.00	
USGS 1	7/20/92	<.01	<.01	0	
USGS 12	9/06/91	<.01	<.01	0	
	11/05/93	.03	.02	1.59	
USGS 15	3/12/92	.01	.02	1.82	
USGS 17	3/13/91	.01	.01	.00	
	6/11/93	.03	.02	1.59	
USGS 19	10/01/92	.01	<.01		U
USGS 23	7/09/93	<.01	<.01	0	
USGS 32	7/06/92	<.01	<.01	0	
USGS 35	10/07/91	.03	.03	.00	
	10/20/93	.03	⊗.03	.00	
USGS 37	10/21/93	.02	.02	.00	

Table 19. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for orthophosphate, as dissolved phosphorus by the National Water Quality Laboratory —continued

Site identifier	Date sampled	Orthophosphate, as dissolved phosphorus (mg/L)	Orthophosphate, as dissolved phosphorus QA (mg/L)	Z-value	Remark
USGS 38	10/14/92	.02	.02	0.00	
USGS 40	10/18/89	.04	.02	2.96	N
USGS 44	10/26/90	.01	.01	.00	
	11/01/93	.02	.02	.00	
USGS 46	10/09/91	.03	.02	1.59	
USGS 57	12/22/89	.17	.12	2.56	N
	10/29/90	.01	.02	1.82	
USGS 58	10/21/93	.02	.02	.00	
USGS 59	10/25/93	.02	.02	.00	
USGS 65	10/15/91	.01	.01	.00	
USGS 76	10/17/90	<.01	<.01	0	
	10/21/93	.02	⊗.02	.00	
USGS 77	10/09/92	.01	.01	.00	
USGS 83	10/11/90	<.01	<.01	0	
USGS 89	10/16/91	.01	<.01		U
USGS 90	10/04/93	.01	.02	1.82	
USGS 97	12/07/90	.02	.03	1.59	
	6/07/91	.02	.01		U
	11/04/93	.03	.04	1.40	
USGS 98	9/21/92	.01	.02	1.82	
USGS 99	10/03/90	.01	<.01		U
	6/16/92	.02	.02	.00	
USGS 102	12/10/90	.02	.02	.00	
	12/09/92	.02	.02	.00	
USGS 104	10/16/89	.04	.04	.00	
	9/29/92	.01	.02	1.82	
USGS 114	10/05/89	.02	.02	.00	
	9/24/90	<.01	.03		U
	10/21/91	.02	.02	.00	
USGS 116	10/05/89	.02	.02	.00	
USGS 122	10/15/91	.01	.01	.00	

Table 20. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for arsenic by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbol: **, the water sample was analyzed for dissolved arsenic, rather than total recoverable arsenic; <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Arsenic (µg/L)	Arsenic QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	2	2	0.00	
NRF-4	2/07/91	2	2	.00	
NRF-6	3/10/92	4	4	.00	
NRF-7	1/08/92	2	<1	.87	
WSINEL1	12/07/90	1	1	.00	
USGS 12	6/15/90	2	2	.00	
USGS 15	8/06/90	2	12	3.79	N
USGS 44	10/26/90	**1	**1	.00	
USGS 97	6/07/90	2	2	.00	
	12/07/90	2	1	.87	
USGS 98	7/30/90	2	1	.68	
USGS 99	10/03/90	2	2	.00	
USGS 102	12/10/90	2	2	.00	
USGS 122	10/15/91	**2	**2	.00	

Table 21. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for barium by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved barium, rather than total recoverable barium]

Site identifier	Date sampled	Barium (µg/L)	Barium QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	<100	<100	0	
NRF-4	2/07/91	100	100	.00	
NRF-6	3/10/92	<100	100	.00	
NRF-7	1/08/92	100	100	.00	
WSINEL1	12/07/90	<100	<100	0	
USGS 12	6/15/90	100	100	.00	
USGS 15	8/06/90	<100	<100	0	
USGS 44	10/26/90	** 90	** 89	.12	
USGS 97	6/07/90	100	100	.00	
	12/07/90	<100	<100	0	
USGS 98	7/30/90	<100	<100	0	
USGS 99	10/03/90	<100	<100	0	
USGS 102	12/10/90	100	100	.00	
USGS 122	10/15/91	** 110	** 110	.00	

Table 22. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for cadmium by the National Water Quality Laboratory

Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved cadmium, rather than total recoverable cadmium]

Site identifier	Date sampled	Cadmium (µg/L)	Cadmium QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	<1	<1	0	
NRF-4	2/07/91	<1	<1	0	
NRF-6	3/10/92	<1	<1	0	
NRF-7	1/08/92	<1	<1	0	
WSINEL1	12/07/90	<1	<1	0	
USGS 12	6/15/90	<1	<1	0	
USGS 15	8/06/90	<1	<1	0	
USGS 44	10/26/90	**<1	**<1	0	
USGS 97	6/07/90	<1	<1	0	
	12/07/90	<1	<1	0	
USGS 98	7/30/90	<1	<1	0	
USGS 99	10/03/90	<1	<1	0	
USGS 102	12/10/90	<1	<1	0	
USGS 122	10/15/91	**<1	**<1	0	

Table 23. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chromium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbols: <, the result was less than the indicated reporting level; *, the water sample was analyzed for total recoverable chromium, rather than dissolved chromium; #, the analysis was performed by the Radiological and Environmental Sciences Laboratory; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Chromium (µg/L)	Chromium QA (µg/L)	Z-value	Remarks	Hexavalent chromium (µg/L)	Hexavalent chromium QA (µg/L)	Z-value	Remark
ARBOR Test	10/01/91	<1	2	0		<1	<1	0	
CFA-2	7/25/91	10	10	.00		6	5	.29	
CPP 1	11/06/89	*2	*4	.60		7	7	.00	
	10/31/90	4	5	.29					
CPP 2	1/31/89	#-.01±0.02	#-.01±0.02	.00					
	4/29/92	4	5	.29		6	6	.00	
CPP 4	7/23/90	*8	*8	.00					
CWP-4	4/25/89	#-.01±0.02	#-.01±0.02	.00					
	4/17/91	<1	1	0		<1	<1	0	
CWP-5	10/14/93	3	2	.30		<1	1	0	
Fire St 2	4/18/91	4	2	.60		5	5	.00	
	10/08/92	5	4	.29		2	2	.00	
MTR Test	10/07/92	6	6	.00		<1	<1	0	
NRF-1	9/09/91	*12	*11	.26					
NRF-2	3/21/90	*14	*14	.00					
	3/21/90	*14	*14	.00					
	3/05/91	*14	*15	.24					
	9/15/93	*9	*10	.27					
NRF-3	6/17/91	*7	*7	.00					
	12/03/92	*10	*4	1.67					
NRF-4	2/07/91	*10	*10	.00					
	4/07/93	*9	*9	.00					
NRF-6	3/10/92	*45	*43	.33					
NRF-7	1/08/92	*9	*8	.27					

Table 23. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chromium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chromium (µg/L)	Chromium QA (µg/L)	Z-value	Remarks	Hexavalent chromium (µg/L)	Hexavalent chromium QA (µg/L)	Z-value	Remark
PW-8	4/05/91	7	7	.00		5	5	0.00	
	7/17/93	14	<1	3.86	N	9	12	1.01	
PW-9	2/04/93	130	130	.00		110	110	.00	
	4/06/93	150	140	.80		170	150	1.07	
Site 14	10/18/91	5	4	.29		4	<1	1.41	
	11/04/93	5	4	.29		4	1	1.41	
Site 19	10/01/90	3	3	.00		1	7	2.60	N
	4/07/92	2	3	.30		<1	<1	0	
TRA A-77	4/16/90	*20	*120	4.47	N				
TRA Dis	1/18/90	*8	*9	.28		1	7	2.60	N
	10/11/90	*10	*10	.00					
TRA 3	4/27/89	#-.01±0.02	#-.01±0.02	.00					
	4/10/92	4	4	.00		<1	1	0	
	11/02/92	3	3	.00		2	2	.00	
TRA 4	11/13/89	<1	<1	0					
	4/25/91	4	3	.30		<1	<1	0	
	10/30/91	3	3	.00		1	2	.49	
	4/05/93	2	2	.00		2	3	.47	
WSINEL1	12/07/90	*10	*10	.00					
	12/03/91	*9	*7	.55					
USGS 12	6/15/90	*8	*7	.28					
	9/06/91	*7	*6	.28					
	11/05/93	*5	*6	.28					
USGS 15	8/06/90	*21	*48	4.95	N				
	3/12/92	*6	*8	.56					
USGS 17	3/13/91	*3	*4	.30					
	6/11/93	*<1	*1	0					

Table 23. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chromium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chromium (µg/L)	Chromium QA (µg/L)	Z-value	Remarks	Hexavalent chromium (µg/L)	Hexavalent chromium QA (µg/L)	Z-value	Remark
USGS 44	10/26/90	7	7	0.00					
USGS 54	7/07/89	#.00±0.02	#.00±0.02	.00					
	11/03/89	#-.02±0.02	#.05±0.01	3.13	N				
	1/14/91	8	9	.27		<1	<1	0	
	10/16/92	66	<1	11.57	N	21	36	3.05	N
	4/19/93	24	24	.00		20	19	.26	
	7/22/93	6	f7	.19		3	<1	.96	
	10/13/93	7	7	.00		4	5	.43	
USGS 56	11/15/89	*91	*100	.96					
USGS 58	4/03/91	10	7	.81		4	10	2.29	N
	10/21/93	10	8	.54		8	8	.00	
USGS 59	10/25/93	3	7	1.15					
USGS 60	1/10/92	16	21	.49		19	17	.53	
USGS 61	9/27/90	20	20	.00		5	15	3.38	N
USGS 62	4/09/92	15	17	.48		6	3	1.28	
	10/13/92	50	40	1.65		11	10	.34	
USGS 63	4/10/90	*9	*9	.00					
USGS 65	10/15/91	200	200	.00		170	170	.00	
USGS 66	4/29/92	16	16	.00		<1	<1	0	
USGS 68	4/27/89	#.02±0.02	#.02±0.02	.00					
	7/02/91	20	20	.00		<1	<1	0	
	1/17/92	10	10	.00		<1	<1	0	
USGS 69	10/24/91	2	<1	.19		<1	<1	0	
USGS 71	4/22/91	60	60	.00		32	58	3.87	N
	10/12/93	50	45	.80		35	40	.86	
USGS 72	10/28/93	<1	<1	0		<1	<1	0	
USGS 76	1/05/90	20	9	2.68	N				

Table 23. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for chromium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Chromium (µg/L)	Chromium QA (µg/L)	Z-value	Remarks	Hexavalent chromium (µg/L)	Hexavalent chromium QA (µg/L)	Z-value	Remark
USGS 76 - cont.	10/17/90	10	10	0.00		11	12	0.33	
	4/26/93	11	10	.26		12	<1	4.21	N
	10/21/93	11	[f]9	.53		10	10	.00	
USGS 84	10/09/92	25	24	.21		25	22	.69	
USGS 97	6/07/90	*8	*9	.27					
	6/07/90	*8	*9	.27					
	12/07/90	*7	*7	.00					
	6/07/91	*5	*8	.84					
	11/04/93	*7	*13	1.58					
USGS 98	7/30/90	*8	*7	.28					
	9/21/92	*5	*4	.29					
USGS 99	10/03/90	*5	*6	.29					
	6/16/92	*3	*2	.30					
USGS 100	1/07/91	2	2	.00					
	10/05/92	1	<1	0		<1	<1	0	
	4/23/93	2	1	.31		<1	<1	.19	
USGS 102	12/10/90	*8	*8	.00					
	12/09/92	*4	*8	1.13					
USGS 122	10/15/91	9	8	.27					

Table 24. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for copper by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbols: **, the water sample was analyzed for dissolved copper, rather than total recoverable copper; <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Copper (µg/L)	Copper QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	16	3	3.47	N
NRF-4	2/07/91	2	3	.32	
NRF-6	3/10/92	5	6	.29	
WSINEL1	12/07/90	2	2	.00	
USGS 12	6/15/90	3	3	.00	
USGS 15	8/06/90	7	2	1.51	
USGS 97	6/07/90	4	3	.31	
	12/07/90	5	3	.61	
USGS 98	7/30/90	1	1	.00	
USGS 99	10/03/90	1	1	.00	
USGS 102	12/10/90	2	1	.33	
USGS 122	10/15/91	**<10	**<10	0	

Table 25. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for iron by the National Water Quality Laboratory

Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved iron, rather than total recoverable iron]

Site identifier	Date sampled	Iron (µg/L)	Iron QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	470	240	7.41	N
NRF-2	3/21/90	50	50	.00	
	3/05/91	<10	10	0	
	9/15/93	20	<10	.70	
NRF-3	6/17/91	60	120	3.36	N
	12/03/92	320	100	9.10	N
NRF-4	2/07/91	50	30	1.30	
	4/07/93	<10	<10	0	
NRF-6	3/10/92	120	80	2.10	N
NRF-7	1/08/92	330	350	.67	
WSINEL1	12/07/90	210	150	2.70	N
	12/03/91	200	170	1.34	
USGS 12	6/15/90	30	50	1.30	
	9/06/91	50	90	2.37	N
	11/05/93	140	270	5.52	N
USGS 15	8/06/90	4,600	9,700	13.50	N
	3/12/92	10	<10	0	
USGS 17	3/13/91	130	110	1.04	
	6/11/93	50	30	1.30	
USGS 97	6/07/90	90	40	3.00	N
	12/07/90	<10	<10	0	
	6/07/91	30	20	.68	
	11/04/93	730	390	8.25	N
USGS 98	7/30/90	50	40	.64	
	9/21/92	80	70	.58	
USGS 99	10/03/90	230	320	3.36	N
	6/16/92	40	70	1.86	
USGS 102	12/10/90	60	200	6.99	N
	12/09/92	30	40	.66	
USGS 122	10/15/91	**20	**30	.66	

Table 26. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for lead by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved lead, rather than total recoverable lead]

Site identifier	Date sampled	Lead (µg/L)	Lead QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	1	<1	0	
NRF-2	3/21/90	2	1	.31	
	3/05/91	<1	<1	0	
	9/15/93	<1	<1	0	
NRF-3	6/17/91	2	2	.00	
	12/03/92	<1	<1	0	
NRF-4	4/07/93	<1	<1	0	
	2/07/91	<1	1	0	
NRF-6	3/10/92	<1	2	.64	
NRF-7	1/08/92	4	3	.29	
WSINEL1	12/07/90	1	2	.31	
	12/03/91	3	<1	0	
USGS 12	6/15/90	1	1	.00	
	9/06/91	<1	<1	0	
	11/05/93	<1	<1	0	
USGS 15	8/06/90	1	3	.61	
	3/12/92	<1	<1	0	
USGS 17	3/13/91	<1	1	0	
	6/11/93	<1	<1	0	
USGS 44	10/26/90	**<1	**<1	0	
USGS 97	6/07/90	3	3	.00	
	12/07/90	1	5	1.16	
	6/07/91	3	3	.00	
	11/04/93	2	3	.57	
USGS 98	7/30/90	1	1	.00	
	9/21/92	1	1	.00	
USGS 99	10/03/90	30	3	4.77	N
	6/16/92	1	2	.31	
USGS 102	12/10/90	1	1	.00	
	12/09/92	<1	<1	0	
USGS 122	10/15/91	**<10	**<10	0	

Table 27. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for manganese by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement; U, statistical agreement of the analytical result is uncertain. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved manganese, rather than total recoverable manganese]

Site identifier	Date sampled	Manganese (µg/L)	Manganese QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	<10	<10	0	
NRF-4	2/07/91	<10	<10	0	
NRF-6	3/10/92	<10	<10	0	
NRF-7	1/08/92	<10	<10	0	
WSINEL1	12/07/90	10	<10		U
USGS 12	6/15/90	<10	<10	0	
USGS 15	8/06/90	100	200	6.20	N
USGS 97	6/07/90	<10	<10	0	
	12/07/90	<10	<10	0	
USGS 98	7/30/90	<10	<10	0	
USGS 99	10/03/90	30	23	.66	
USGS 102	12/10/90	<10	10		U
USGS 122	10/15/91	**12	**13	.9	

Table 28. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for mercury by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbol: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved mercury, rather than total recoverable mercury]

Site identifier	Date sampled	Mercury (µg/L)	Mercury QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	<0.1	<0.1	0	
NRF-2	3/21/90	<.1	<.1	0	
	3/05/91	<.1	<.1	0	
	9/15/93	<.1	<.1	0	
NRF-3	6/17/91	<.1	<.1	0	
	12/03/92	<.1	<.1	0	
NRF-4	2/07/91	<.1	<.1	0	
	4/07/93	<.1	<.1	0	
NRF-6	3/10/92	<.1	<.1	0	
NRF-7	1/08/92	<.1	<.1	0	
WSINEL1	12/07/90	<.1	<.1	0	
	12/03/91	<.1	<.1	0	
USGS 12	6/15/90	<.1	<.1	0	
	9/06/91	<.1	<.1	0	
	11/05/93	<.1	<.1	0	
USGS 15	8/06/90	<.1	.1	.00	
	3/12/92	<.1	<.1	0	
USGS 17	3/13/91	<.1	<.1	0	
	6/11/93	<.1	<.1	0	
USGS 44	10/26/90	**.1	**.1	.00	
USGS 97	6/07/90	<.1	<.1	0	
	12/07/90	<.1	<.1	0	
	6/07/91	<.1	<.1	0	
	11/04/93	<.1	<.1	0	
USGS 98	7/30/90	<.1	<.1	0	
	9/21/92	<.1	<.1	0	
USGS 99	10/03/90	<.1	<.1	0	
	6/16/92	<.1	<.1	0	
USGS 102	12/10/90	<.1	<.1	0	
	12/09/92	<.1	<.1	0	

Table 29. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for nickel by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved nickel, rather than total recoverable nickel]

Site identifier	Date sampled	Nickel (µg/L)	Nickel QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	2	2	0.00	
NRF-2	3/21/90	3	2	.28	
	3/05/91	<1	<1	0	
	9/15/93	<1	<1	0	
NRF-3	6/17/91	4	3	.27	
	12/03/92	2	<1	.58	
NRF-4	2/07/91	<1	<1	0	
	4/07/93	<1	<1	0	
NRF-6	3/10/92	21	17	.76	
NRF-7	1/08/92	4	3	.27	
WSINEL1	12/07/90	2	<1	.58	
	12/03/91	1	<1	0	
USGS 12	6/15/90	1	2	.28	
	9/06/91	1	2	.28	
	11/05/93	2	2	.00	
USGS 15	8/06/90	15	31	2.79	N
	3/12/92	<1	<1	0	
USGS 17	3/13/91	1	1	.00	
	6/11/93	<1	<1	0	
USGS 97	6/07/90	1	1	.00	
	12/07/90	<1	1	0	
	6/07/91	<1	<1	0	
USGS 98	7/30/90	<1	<1	0	
	9/21/92	<1	<1	0	
USGS 99	10/03/90	1	3	.56	
	6/16/92	<1	1	.29	
USGS 102	12/10/90	2	1	.28	
	12/09/92	2	2	.00	
USGS 122	10/15/91	**10	**<10	0	

Table 30. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for selenium by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved selenium, rather than total recoverable selenium]

Site identifier	Date sampled	Selenium (µg/L)	Selenium QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	1	2	0.79	
NRF-4	2/07/91	2	2	.00	
NRF-6	3/10/92	2	2	.00	
NRF-7	1/08/92	<1	1	0	
WSINEL1	12/07/90	2	2	.00	
USGS 12	6/15/90	2	2	.00	
USGS 15	8/06/90	1	1	.00	
USGS 44	10/26/90	**2	**2	.00	
USGS 97	6/07/90	2	2	.00	
	12/07/90	1	1	.00	
USGS 98	7/30/90	1	1	.00	
USGS 99	10/03/90	1	1	.00	
USGS 102	12/10/90	1	1	.00	
USGS 122	10/15/91	**1	**<1	0	

Table 31. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for silver by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved silver, rather than total recoverable silver]

Site identifier	Date sampled	Silver (µg/L)	Silver QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	<1	<1	0	
NRF-2	3/21/90	<1	<1	0	
	3/05/91	<1	<1	0	
	9/15/93	<1	<1	0	
NRF-3	6/17/91	<1	<1	0	
	12/03/92	<1	<1	0	
NRF-4	2/07/91	<1	<1	0	
	4/07/93	<1	<1	0	
NRF-6	3/10/92	<1	<1	0	
NRF-7	1/08/92	<1	<1	0	
WSINEL1	12/03/91	<1	<1	0	
USGS 12	6/15/90	<1	<1	0	
	9/06/91	<1	<1	0	
	11/05/93	<1	<1	0	
USGS 15	8/06/90	<1	<1	0	
	3/12/92	<1	<1	0	
USGS 17	3/13/91	<1	<1	0	
	6/11/93	<1	<1	0	
USGS 44	10/26/90	**<1	**<1	0	
USGS 97	6/07/90	<1	<1	0	
	12/07/90	<1	<1	0	
	6/07/91	<1	<1	0	
	11/04/93	<1	<1	0	
USGS 98	7/30/90	<1	<1	0	
	9/21/92	<1	<1	0	
USGS 99	10/03/90	<1	<1	0	
	6/16/92	<1	<1	0	
USGS 102	12/10/90	<1	<1	0	
	12/09/92	<1	<1	0	
USGS 122	10/15/91	**<1	**<1	0	
	12/07/90	<1	<1	0	

Table 32. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for zinc by the National Water Quality Laboratory

[Site identifier: see figures 1-3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: µg/L, microgram per liter. Symbols: <, the result was less than the indicated reporting level; **, the water sample was analyzed for dissolved zinc, rather than total recoverable zinc]

Site identifier	Date sampled	Zinc QA (µg/L)	Zinc (µg/L)	Z-value	Remark
NRF-2	3/21/90	<10	<10	0	
NRF-4	2/07/91	<10	10	0	
NRF-6	3/10/92	10	20	.94	
NRF-7	1/08/92	40	30	.94	
WSINEL1	12/07/90	120	130	.68	
USGS 12	6/15/90	10	10	.00	
USGS 15	8/06/90	50	30	1.89	
USGS 97	6/07/90	80	80	.00	
	12/07/90	110	120	.71	
USGS 98	7/30/90	110	120	.71	
USGS 99	10/03/90	80	90	.83	
USGS 102	12/10/90	<10	<10	0	
USGS 122	10/15/91	**5	**10	.47	

Table 33. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross alpha radioactivity, dissolved in water, as thorium-230 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross alpha, dissolved, as thorium-230 (pCi/L)	Gross alpha, dissolved, as thorium-230 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	2.33±0.784	2.19±0.753	0.26	
NRF-2	3/21/90	2.86±0.899	2.75±0.942	.17	
	3/05/91	2.84±0.894	3.02±0.881	.29	
	9/15/93	3.38±1.93	4.42±2.31	.69	
NRF-3	6/17/91	3.04±0.873	2.26±0.781	1.33	
	12/03/92	3.69±1.75	3.95±2.18	.19	
NRF-4	2/07/91	2.72±0.818	3.15±0.915	.70	
	4/07/93	2.49±0.862	2.10±0.873	.64	
NRF-6	3/10/92	3.35±3.07	1.97±0.705	.88	
NRF-7	1/08/92	1.28±0.587	1.36±0.586	.19	
WSINEL1	12/07/90	2.23±0.778	2.67±0.827	.78	
	12/03/91	1.69±0.677	2.29±0.770	1.17	
USGS 12	6/15/90	1.47±0.648	3.56±1.03	3.44	N
	9/06/91	2.23±0.778	2.09±0.745	.26	
	11/05/93	3.33±1.83	3.59±1.75	.21	
USGS 15	8/06/90	2.44±0.814	1.51±0.673	1.76	
	3/12/92	1.37±0.624	1.74±0.669	.81	
USGS 17	3/13/91	1.26±0.586	1.35±0.591	.22	
	6/11/93	1.38±0.827	2.08±1.06	1.04	
USGS 97	6/07/90	2.80±0.848	2.60±0.842	.33	
	12/07/90	1.82±0.682	2.76±0.868	1.70	
	6/07/91	3.47±0.965	3.13±0.906	.51	
	11/04/93	1.70±1.31	3.79±1.19	2.36	N
USGS 98	7/30/90	2.16±0.802	1.81±0.718	.65	
	9/21/92	1.02±0.485	2.13±0.754	2.48	N
USGS 99	10/03/90	2.30±0.781	2.71±0.850	.71	
	6/16/92	1.27±0.560	1.28±0.609	.02	
USGS 102	12/10/90	2.63±0.830	2.97±0.887	.56	
	12/09/92	2.15±1.42	3.48±1.75	1.18	

Table 34. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross alpha radioactivity, suspended in water, as thorium-230 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross alpha, suspended, as thorium-230 (pCi/L)	Gross alpha, suspended, as thorium-230 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	-0.064±0.125	-0.016±0.169	0.46	
NRF-2	3/21/90	.143±0.242	.020±0.165	.84	
	3/05/91	.291±0.327	-.066±0.129	2.03	N
NRF-3	6/17/91	.047±0.144	-.015±0.165	.57	
	12/03/92	-.200±0.192	.066±0.184	2.00	N
NRF-4	2/07/91	.021±0.126	.122±0.224	.79	
	4/07/93	.065±0.149	.166±0.211	.78	
NRF-6	3/10/92	-.005±0.091	.116±0.213	1.04	
NRF-7	1/08/92	.012±0.210	.065±0.264	.31	
WSINEL1	12/07/90	-.168±0.206	.025±0.233	1.24	
	12/03/91	.217±0.288	-.065±0.253	1.47	
USGS 12	6/15/90	.005±0.203	.031±0.220	.17	
	9/06/91	.022±0.130	.098±0.179	.69	
USGS 15	8/06/90	2.20±1.42	7.28±5.24	1.87	
	3/12/92	.035±0.191	-.005±0.095	.38	
USGS 17	3/13/91	.056±0.227	.197±0.234	.86	
USGS 97	6/07/90	.022±0.274	.000±0.292	.11	
	12/07/90	-.044±0.170	.046±0.142	.81	
	6/07/91	.097±0.171	.020±0.119	.74	
USGS 98	7/30/90	.020±0.258	.000±0.428	.08	
	9/21/92	.056±0.228	.136±0.243	.48	
USGS 99	10/03/90	-.005±0.247	.049±0.282	.29	
	6/16/92	-.103±0.176	.232±0.328	1.80	
USGS 102	12/10/90	.005±0.204	-.144±0.220	.99	
	12/09/92	.117±0.213	.055±0.225	.40	

Table 35. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross alpha radioactivity, dissolved in water, as natural uranium by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross alpha, dissolved, as natural uranium (µg/L)	Gross alpha, dissolved, as natural uranium QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	3.33±1.13	3.12±1.05	0.27	
NRF-2	3/21/90	4.25±1.31	4.47±1.44	.23	
	3/05/91	2.81±0.884	3.01±0.871	.32	
	9/15/93	4.56±2.61	5.73±3.01	.59	
NRF-3	6/17/91	4.38±1.27	3.66±1.19	.83	
	12/03/92	5.13±2.45	5.12±2.84	.01	
NRF-4	2/07/91	3.95±1.20	4.40±1.28	.51	
	4/07/93	3.56±1.22	3.03±1.25	.61	
NRF-6	3/10/92	4.35±3.99	2.88±1.02	.71	
NRF-7	1/08/92	1.85±0.844	1.98±0.843	.22	
WSINEL1	12/07/90	3.58±1.19	3.58±1.19	.00	
	12/03/91	2.72±1.05	3.33±1.10	.80	
USGS 12	6/15/90	2.08±0.196	5.11±1.46	4.11	N
	9/06/91	3.16±1.10	3.03±1.07	.17	
	11/05/93	4.50±2.48	5.15±2.51	.73	
USGS 15	8/06/90	3.48±1.15	2.41±1.04	1.38	
	3/12/92	1.87±0.853	2.48±0.949	.96	
USGS 17	3/13/91	1.26±0.583	1.51±0.637	.58	
	6/11/93	1.91±1.15	2.81±1.44	.98	
USGS 97	6/07/90	4.05±1.21	4.22±1.28	.19	
	12/07/90	2.64±0.986	3.86±1.21	1.56	
	6/07/91	4.96±1.37	4.50±1.29	.49	
	11/04/93	2.29±1.77	5.31±2.69	1.88	
USGS 98	7/30/90	3.44±1.23	2.60±1.02	1.05	
	09/21/92	1.49±0.711	2.97±1.05	2.33	N
USGS 99	10/03/90	.442±0.346	.449±0.414	.03	
	6/16/92	1.82±0.806	1.76±0.838	.10	
USGS 102	12/10/90	3.83±1.19	4.27±1.27	.51	
	12/09/92	3.04±2.01	4.92±2.49	1.17	

Table 36. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross alpha radioactivity, suspended in water, as natural uranium by the National Water Quality Laboratory

Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross alpha, suspended, as natural uranium (µg/L)	Gross alpha, suspended, as natural uranium QA (µg/L)	Z-value	Remark
NRF-1	9/09/91	-0.119±0.231	-0.028±0.295	0.49	
NRF-2	3/21/90	.273±0.459	.038±0.311	.85	
	3/05/91	.539±0.595	-.122±0.236	2.07	N
NRF-3	6/17/91	.083±0.251	-.028±0.303	.56	
	12/03/92	-.348±0.329	.122±0.336	2.00	N
NRF-4	2/07/91	.037±0.216	.209±0.374	.80	
	4/07/93	.120±0.271	.217±0.389	.41	
NRF-6	3/10/92	-.009±0.171	.216±0.387	1.06	
NRF-7	1/08/92	.017±0.300	.094±0.382	.32	
WSINEL1	12/07/90	-.293±0.345	.048±0.440	1.22	
	12/03/91	.388±0.494	-.118±0.461	1.50	
USGS 12	6/15/90	.009±0.372	.058±0.406	.18	
	9/06/91	.034±0.198	.175±0.313	.76	
USGS 15	8/06/90	1.76±1.12	9.10±6.01	2.40	N
	3/12/92	.066±0.357	-.009±0.174	.38	
USGS 17	3/13/91	.170±0.433	.365±0.415	.65	
USGS 97	6/07/90	.036±0.447	.000±0.390	.12	
	12/07/90	-.082±0.314	.084±0.253	.82	
	6/07/91	.185±0.227	.039±0.330	.73	
USGS 98	7/30/90	.037±0.465	.000±0.428	.12	
	9/21/92	.107±0.433	.255±0.447	.48	
USGS 99	10/03/90	-.008±0.448	.081±0.464	.28	
	6/16/92	-.185±0.310	.418±0.569	1.86	
USGS 102	12/10/90	.009±0.355	-.245±0.366	1.00	
	12/09/92	.215±0.385	.104±0.420	.39	

Table 37. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross alpha radioactivity by the Radiological and Environmental Sciences Laboratory

Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: pCi/L, picocurie per liter]

Site identifier	Date sampled	Gross alpha (pCi/L)	Gross alpha QA (pCi/L)	Z-value	Remark
Big Lost River	10/09/91	1.4±1.1	2.8±1.3	0.82	
Cerro Grande	10/18/90	13±6	13±6	.00	
USGS 8	4/03/91	.7±0.8	.0±0.8	.62	
USGS 11	10/08/91	1.0±1.1	1.0±1.1	.00	
USGS 14	10/01/92	1.7±0.9	3.1±1.2	.93	
	4/16/93	2.1±1.0	2.1±1.0	.00	

Table 38. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross beta radioactivity, dissolved in water, as cesium-137 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross beta, dissolved, as cesium-137 (pCi/L)	Gross beta, dissolved, as cesium-137 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	3.33±1.38	3.59±1.35	0.27	
NRF-2	3/21/90	4.69±1.37	3.81±1.31	.93	
	3/05/91	3.86±1.29	3.83±1.28	.03	
	9/15/93	4.89±1.31	4.83±1.34	.06	
NRF-3	6/17/91	2.68±1.01	2.94±1.08	.35	
	12/03/92	3.14±1.02	2.74±0.994	.56	
NRF-4	2/07/91	3.37±1.15	4.56±1.37	1.33	
	4/07/93	3.56±1.12	5.00±1.35	1.64	
NRF-6	3/10/92	6.87±1.95	5.87±1.87	.74	
NRF-7	1/08/92	3.34±1.08	3.48±1.07	.18	
WSINEL1	12/07/90	5.72±1.60	5.22±1.52	.45	
	12/03/91	4.99±1.66	5.44±1.72	.38	
USGS 12	6/15/90	4.79±1.46	3.62±1.23	1.23	
	9/06/91	2.95±1.18	2.27±1.14	.83	
	11/05/93	3.79±2.05	3.99±1.16	.17	
USGS 15	8/06/90	3.91±1.32	4.38±1.76	.43	
	3/12/92	1.98±0.843	1.89±0.821	.15	
USGS 17	3/13/91	2.86±1.02	3.02±1.00	.22	
	6/11/93	2.70±1.01	3.08±1.04	.52	
USGS 97	6/07/90	3.58±1.31	3.37±1.29	.23	
	12/07/90	4.66±1.29	3.43±1.11	1.45	
	6/07/91	4.25±1.30	3.09±1.22	1.30	
	11/04/93	4.15±1.15	3.53±1.17	.76	
USGS 98	7/30/90	2.92±1.03	3.59±1.03	.92	
	9/21/92	3.76±1.18	3.63±1.06	.16	
USGS 99	10/03/90	2.33±0.956	4.28±1.23	2.50	N
	6/16/92	2.25±0.863	2.43±0.907	.29	
USGS 102	12/10/90	3.56±1.15	4.18±1.24	.73	
	12/09/92	2.88±0.980	3.25±1.02	.52	

Table 39. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross beta radioactivity, suspended in water, as cesium-137 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross beta, suspended, as cesium-137 (pCi/L)	Gross beta, suspended, as cesium-137 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	0.439±0.578	0.184±0.546	0.64	
NRF-2	3/21/90	.311±0.505	-.144±0.552	1.22	
	3/05/91	.731±0.593	.467±0.521	.67	
NRF-3	6/17/91	.080±0.479	.453±0.501	1.08	
	12/03/92	.209±0.539	.483±0.587	.69	
NRF-4	2/07/91	.182±0.507	.638±0.567	1.20	
	4/07/93	.262±0.479	.327±0.469	.19	
NRF-6	3/10/92	.537±0.491	.421±0.531	.32	
NRF-7	1/08/92	.696±0.538	.608±0.525	.23	
WSINEL1	12/07/90	.043±0.455	.378±0.521	.97	
	12/03/91	.055±0.494	.384±0.542	.90	
USGS 12	6/15/90	.318±0.575	-.079±0.609	.95	
	9/06/91	.693±0.542	.430±0.504	.71	
USGS 15	8/06/90	2.12±0.829	7.40±2.05	4.78	N
	3/12/92	.266±0.496	.313±0.489	.13	
USGS 17	3/13/91	.646±0.601	.672±0.633	.06	
USGS 97	6/07/90	.114±0.596	.314±0.541	.50	
	12/07/90	.119±0.425	.191±0.495	.22	
	6/07/91	.381±0.472	.427±0.503	.13	
USGS 98	7/30/90	.464±0.512	.093±0.459	1.08	
	9/21/92	.490±0.524	.635±0.475	.41	
USGS 99	10/03/90	-.169±0.521	-.088±0.532	.22	
	6/16/92	.457±0.532	.480±0.536	.06	
USGS 102	12/10/90	.123±0.485	-.052±0.471	.52	
	12/09/92	.023±0.510	.242±0.543	.59	

Table 40. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross beta radioactivity, dissolved in water, as strontium-90/yttrium-90 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: Sr-90/Y-90, strontium-90/yttrium-90; pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross beta, dissolved, Sr-90/Y-90 (pCi/L)	Gross beta, dissolved, Sr-90/Y-90 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	2.45±1.18	2.76±1.04	0.39	
NRF-2	3/21/90	3.48±1.02	2.85±0.979	.89	
	3/05/91	2.92±0.975	2.88±0.962	.06	
	9/15/93	3.64±0.977	3.61±1.00	.04	
NRF-3	6/17/91	2.02±0.757	2.20±0.805	.33	
	12/03/92	2.38±0.774	2.03±0.739	.65	
NRF-4	2/07/91	2.55±0.871	3.43±1.03	1.30	
	4/07/93	2.70±0.850	3.76±1.02	1.60	
NRF-6	3/10/92	5.53±1.57	4.78±1.52	.69	
NRF-7	1/08/92	2.55±0.910	2.61±0.706	.10	
WSINEL1	12/07/90	4.27±1.20	3.91±1.14	.43	
	12/03/91	3.78±1.26	4.04±1.28	.29	
USGS 12	6/15/90	3.61±1.10	2.62±0.809	1.45	
	9/06/91	2.31±0.921	1.67±0.799	1.05	
	11/05/93	3.05±1.59	2.98±0.862	.08	
USGS 15	8/06/90	2.95±0.996	3.20±1.20	.32	
	3/12/92	1.48±0.591	1.40±0.572	.19	
USGS 17	3/13/91	2.12±0.673	2.26±0.674	.29	
	6/11/93	2.02±0.672	2.32±0.889	.54	
USGS 97	6/07/90	2.68±0.983	2.52±0.965	.23	
	12/07/90	3.49±0.965	2.58±0.835	1.43	
	6/07/91	3.20±0.977	2.36±0.931	1.24	
	11/04/93	3.14±0.874	2.66±0.880	.77	
USGS 98	7/30/90	2.13±0.689	2.75±0.786	1.19	
	9/21/92	2.74±1.13	2.72±0.794	.03	
USGS 99	10/03/90	1.75±0.720	3.28±0.939	2.59	N
	6/16/92	1.70±0.678	1.82±0.678	.25	
USGS 102	12/10/90	2.66±0.860	3.14±0.931	.76	
	12/09/92	2.18±0.743	2.44±0.768	.49	

Table 41. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross beta radioactivity, suspended in water, as strontium-90/yttrium-90 by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: Sr-90/Y-90, strontium-90/yttrium-90; pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gross beta, suspended, Sr-90/Y-90 (pCi/L)	Gross beta, suspended, Sr-90/Y-90 QA (pCi/L)	Z-value	Remark
NRF-1	9/09/91	0.415±0.545	0.174±0.515	0.64	
NRF-2	3/21/90	.298±0.438	-.114±0.436	1.33	
	3/05/91	.582±0.473	.447±0.498	.39	
NRF-3	6/17/91	.078±0.464	.427±0.473	1.05	
	12/03/92	.200±0.515	.468±0.569	.70	
NRF-4	2/07/91	.174±0.485	.617±0.480	1.30	
	4/07/93	.250±0.459	.308±0.443	.18	
NRF-6	3/10/92	.520±0.476	.403±0.508	.34	
NRF-7	1/08/92	.676±0.522	.573±0.495	.29	
WSINEL1	12/07/90	.042±0.440	.357±0.491	.96	
	12/03/91	.054±0.480	.371±0.520	.90	
USGS 12	6/15/90	.256±0.463	-.062±0.481	.95	
	9/06/91	.672±0.526	.418±0.490	.71	
USGS 15	8/06/90	1.68±0.659	5.74±1.60	4.69	N
	3/12/92	.251±0.469	.303±0.474	.16	
USGS 17	3/13/91	.520±0.484	.531±0.501	.03	
USGS 97	6/07/90	.090±0.468	.252±0.435	.51	
	12/07/90	.114±0.406	.180±0.467	.21	
	6/07/91	.360±0.446	.409±0.481	.15	
USGS 98	7/30/90	.425±0.498	.089±0.439	1.01	
	9/21/92	.463±.0.494	.607±0.454	.43	
USGS 99	10/03/90	-.165±0.507	-.086±0.517	.22	
	6/16/92	.438±0.509	.453±0.505	.04	
USGS 102	12/10/90	.116±0.458	-.051±0.458	.52	
	12/09/92	.022±0.496	.231±0.519	.58	

Table 42. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gross beta radioactivity by the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: pCi/L, picocurie per liter]

Site identifier	Date sampled	Gross beta (pCi/L)	Gross beta QA (pCi/L)	Z-value	Remark
Big Lost River	10/09/91	2±2	1±2	0.35	
Cerro Grande	10/18/90	5±2	5±2	.00	
USGS 8	4/03/91	0±2	3±2	1.06	
USGS 11	10/08/91	1.3±1.9	2±2	.25	
USGS 14	10/01/92	4±2	4±2	.00	
	4/16/93	4±2	4±2	.00	

Table 43. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gamma radiation by the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Gamma radiation (pCi/L)	Gamma radiation, QA (pCi/L)	Z-value	Remark
Big Lost River	10/09/91	20±20	-10±30	0.83	
Cerro Grande	10/18/90	-70±30	11±29	1.94	
PW-1	4/24/89	-40±30	0±30	.94	
PW-3	3/30/90	10±30	20±30	.24	
PW-4	4/29/91	11±26	-20±20	.95	
PW-8	4/05/91	20±40	-25±15	1.05	
PW-9	4/06/93	0±30	-41±15	1.22	
RWMC Prod.	10/30/90	0±30	-10±30	.24	
TRA Disp.	1/18/90	13±25	10±30	.08	
	10/11/90	70±30	0±30	1.65	
USGS 8	4/03/91	10±20	-20±30	.83	
USGS 11	10/08/91	20±30	60±30	.94	
USGS 14	10/01/92	10±30	-30±20	1.11	
	4/16/93	0±30	50±30	1.18	
USGS 37	10/21/93	30±20	50±30	.55	
USGS 40	10/18/89	-20±40	-20±40	.00	
	4/25/91	60±30	-40±30	2.36	N
USGS 43	4/13/90	-40±40	40±30	1.60	
USGS 44	10/26/90	40±40	-10±20	1.12	
	11/01/93	-20±20	0±20	.71	
USGS 46	10/09/91	0±30	0±20	.00	
USGS 47	4/10/91	14±19	-40±40	1.22	
USGS 54	4/19/93	-30±20	0±30	.83	
USGS 58	4/03/91	-10±20	0±20	.35	
USGS 62	4/09/92	16±22	10±20	.20	
USGS 63	4/10/90	13±36	16±28	.07	
USGS 65	10/15/91	-12±27	20±30	.79	
USGS 66	4/29/92	-20±30	0±20	.55	
USGS 68	7/02/91	20±30	30±30	.24	
USGS 71	4/22/91	10±40	12±26	.04	
USGS 76	1/05/90	0±30	60±50	1.03	
	10/17/90	-20±40	-30±20	.22	
	4/26/93	-20±30	20±30	.94	
USGS 87	4/21/92	0±20	40±30	1.11	
USGS 88	7/12/89	20±30	-20±30	.94	

Table 43. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for gamma radiation by the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Gamma radiation (pCi/L)	Gamma radiation, QA (pCi/L)	Z-value	Remark
USGS 88 - cont.	7/16/91	70±30	70±40	0.00	
	1/20/93	16±29	20±30	.10	
USGS 89	1/04/89	0±30	0±20	.00	
	10/16/91	-2±15	10±20	.48	
USGS 90	1/18/89	90±30	-70±30	3.77	N
	1/23/90	50±40	-30±30	1.60	
	1/16/92	-10±20	17±27	.80	
	4/20/92	0±20	20±20	.71	
	10/04/93	-40±30	-20±20	.55	
USGS 117	4/18/91	-30±20	0±40	.67	
USGS 119	4/03/89	-14±39	0±30	.28	
	4/09/90	60±30	0±30	1.41	
USGS 120	7/19/90	-30±40	10±30	.80	

Table 44. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for radium-226 and radium-228 by the National Water Quality Laboratory

[Site identifier: see figures 1-3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Radium-226 (pCi/L)	Radium-226 QA (pCi/L)	Z-value	Remark
NRF-4	2/07/91	0.035±0.014	0.023±0.008	1.49	
NRF-6	3/10/92	.017±0.013	.029±0.009	1.52	
NRF-7	1/08/92	.047±0.011	.042±0.014	.54	
WSINEL1	12/07/90	.089±0.020	.152±0.026	3.84	N
USGS 12	6/15/90	.064±0.014	.050±0.012	1.52	
USGS 15	8/06/90	.102±0.018	.048±0.014	4.74	N
USGS 97	6/07/90	.097±0.018	.088±0.018	.71	
	12/07/90	.086±0.016	.094±0.020	.62	
USGS 98	7/30/90	.093±0.020	.054±0.016	3.05	N
USGS 99	10/03/90	.011±0.016	.109±0.020	7.65	N
USGS 102	12/10/90	.087±0.018	.116±0.022	2.04	N

Site identifier	Date sampled	Radium-228 (pCi/L)	Radium-228 QA (pCi/L)	Z-value	Remark
NRF-2	3/21/90	0.085±0.252	0.144±0.327	0.29	
NRF-4	2/07/91	.370±0.319	.215±0.279	.73	
NRF-6	3/10/92	.232±0.279	.233±0.303	.00	
NRF-7	1/08/92	.175±0.257	.126±0.268	.26	
WSINEL1	12/07/90	.256±0.263	.437±0.280	.94	
USGS 12	6/15/90	.409±0.684	.153±0.602	.56	
USGS 15	8/06/90	.058±0.756	.539±0.896	.82	
USGS 97	6/07/90	.111±0.366	.393±0.448	.97	
	12/07/90	.224±0.261	.086±0.237	.78	
USGS 98	7/30/90	-.070±0.474	.260±0.422	1.04	
USGS 99	10/03/90	.442±0.247	.449±0.282	.04	
USGS 102	12/10/90	.222±0.252	.256±0.245	.19	

Table 45. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for strontium-90 by the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement. Symbols: ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Strontium-90 (pCi/L)	Strontium-90 QA (pCi/L)	Z-value	Remark
Area II	7/14/93	-2±2	1±2	1.06	
CPP 1	11/06/89	2.1±1.3	2.3±1.3	.11	
	10/31/90	-1.4±2.1	-1.3±2.0	.03	
CPP 2	1/31/89	-.9±1.5	-2.1±1.4	.58	
	7/26/89	-5±2	-7±2	.71	
	4/29/92	-.3±1.4	.5±1.6	.38	
CPP 4	7/23/90	0±2	.9±1.6	.35	
CWP-4	4/25/89	2±1.4	.4±1.5	.78	
	4/17/91	-4.9±1.5	-4±2	.36	
CWP-5	10/14/93	.8±1.5	3±2	.88	
PW-1	4/24/89	20±2	22±2	.71	
	10/27/89	18±2	21±2	1.06	
	7/03/90	19±2	20±2	.35	
PW-2	1/08/91	6±2	3±2	1.06	
	10/25/93	0±2	9±2	3.18	N
PW-3	3/30/90	12±2	10±2	.71	
PW-4	2/02/90	3.8±1.7	6±2	.84	
	10/17/90	8±2	10±3	.55	
	4/29/91	8±2	7±2	.35	
	10/22/92	8±2	8±2	.00	
PW-5	10/17/91	11±2	12±3	.28	
PW-8	4/05/91	18±2	18±2	.00	
	7/17/93	16±2	12±2	1.41	
PW-9	2/04/93	-2 ±2	4±2	2.12	N
	4/06/93	-.7±1.6	3±2	1.44	
RWMC Prod.	10/30/90	1±2	-1±2	.71	
Site 14	10/18/91	1.3±2.4	-3±2	1.38	
USGS 1	7/20/92	1.1±1.5	1.7±1.5	.28	
USGS 20	4/08/91	.8±1.6	-1.9±1.5	1.23	
USGS 23	7/09/93	1.4±1.7	-1±2	.91	
USGS 32	7/06/92	-.4±1.3	-2.5±1.5	1.06	
USGS 34	4/01/91	3±2	4±2	.35	
USGS 35	10/07/91	-7±2	4±2	3.89	N
	4/14/93	2±2	5±2	1.06	
	10/21/93	7±3	⊗6±2	.28	

Table 45. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for strontium-90 by the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Strontium-90 (pCi/L)	Strontium-90 QA (pCi/L)	Z-value	Remark
USGS 37	1/02/90	16±2	14±2	0.71	
	4/18/90	13±2	9±2	1.41	
	10/21/93	20±3	14±2	1.66	
USGS 38	4/23/92	27±2	27±3	.00	
	10/14/92	27±3	22±3	1.18	
USGS 40	10/18/89	31±3	24±3	1.65	
	4/25/91	22±3	22±3	.00	
USGS 43	4/13/90	-.5±1.6	1.2±1.5	.78	
USGS 44	10/26/90	6±2	6±2	.00	
	11/01/93	5±2	7±2	.82	
USGS 45	4/20/92	1.2±1.5	.7±1.6	.23	
USGS 46	10/09/91	10±3	10±3	.00	
USGS 47	4/10/91	50±4	48±4	.35	
USGS 52	4/03/90	14±2	9±2	1.77	
USGS 54	10/16/92	95±5	98±5	.42	
	4/19/93	86±5	90±5	.57	
	7/22/93	101±5	⊗105±5	.57	
	10/13/93	94±5	99±5	.71	
USGS 57	12/22/89	45±4	43±3	.40	
	6/28/90	46±4	43±3	.60	
	10/29/90	41±4	34±3	1.40	
	7/21/93	36±3	⊗33±3	.71	
USGS 59	4/17/89	15±2	14±2	.35	
	4/28/92	11±2	14±2	1.06	
	4/22/93	14±2	13±2	.35	
	10/25/93	9±2	14±2	1.77	
USGS 60	1/10/92	2±2	1.9±1.6	.04	
USGS 61	9/27/90	0±2	-2±2	.71	
USGS 62	4/09/92	1.2±1.3	-.4±1.4	.84	
	10/13/92	0±2	-2±2	.71	
USGS 65	10/15/91	0±2	0±2	.00	
USGS 66	4/29/92	2.4±1.5	-1.9±1.6	1.96	N
USGS 68	4/27/89	-3±2	51±4	12.07	N
	7/02/91	6±2	0±2	2.12	N
	1/17/92	-.3±1.4	.7±1.6	.47	
USGS 69	10/24/91	-3±2	0±2	1.06	
USGS 71	4/22/91	3±2	.5±1.5	1.00	
	10/12/93	-3±2	2±1.7	1.90	

Table 45. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for strontium-90 by the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Strontium-90 (pCi/L)	Strontium-90 QA (pCi/L)	Z-value	Remark
USGS 72	10/28/93	-1±2	1.1±1.6	0.82	
USGS 76	1/05/90	-2.4±1.4	-1.7±1.6	.33	
	10/17/90	3±2	.9±1.6	.82	
	4/26/93	-1.1±1.8	-1.4±1.5	.13	
	10/22/93	0±2	⊗-.7±1.5	.28	
USGS 77	10/09/92	0±2	-1.0±2	.35	
USGS 82	4/15/92	2.2±1.6	-.4±1.6	1.15	
	7/07/93	.8±1.7	1.3±1.8	.20	
USGS 85	4/26/90	4±2	2±2	.71	
	4/19/93	2±2	2±2	.00	
USGS 87	4/21/92	-1.1±2.1	−1.0±2.0	.03	
USGS 88	7/12/89	-.6±1.5	-1.7±1.5	.52	
	7/16/91	-1.6±2.4	-3±2	.45	
	1/20/93	-1.6±1.9	-1.6±1.9	.00	
USGS 89	1/04/89	0±1.3	3.3±1.4	1.73	
	10/16/91	-2±2	-2±2	.00	
	1/17/92	-.6±1.4	-.1±1.2	.27	
USGS 90	1/18/89	.4±1.3	1.5±1.4	.58	
	1/23/90	-2.9±1.6	-2.4±1.6	.22	
	1/16/92	.6±1.4	1.0±1.5	.19	
	4/20/92	-2±2	0±2	.71	
	10/04/93	-.8±1.4	-1±2	.08	
USGS 111	3/20/90	1±2	-2±1.6	1.17	
USGS 113	7/15/91	19±3	15±3	.94	
USGS 114	10/05/89	.9±1.5	.6±1.4	.15	
	9/24/90	-2±2	1±2	1.06	
	10/21/91	3±2	-4±2	2.47	N
USGS 115	7/16/93	-4±2	1.3±1.7	2.02	N
USGS 116	4/06/89	-4.3±1.5	-4±2	.12	
	10/05/89	1±1.5	-1.3±1.3	1.16	
USGS 117	4/18/91	1±1.7	-1±2	.76	
USGS 119	4/03/89	0±1.5	.3±1.4	.15	
	6/28/89	-1.4±1.4	-.7±1.4	.35	
	4/09/90	1.8±1.6	-.2±1.5	.91	
USGS 119	7/09/92	-4±2	-1.2±1.5	1.12	
USGS 120	7/19/90	3±2	2±2	.35	
USGS 122	10/15/91	-1±2	1.6±2.2	.87	
	4/15/92	0±2	3±2	1.06	

Table 46. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement. Symbols: ##, the analyses were performed by the National Water Quality Laboratory; ⊗, the QA sample was collected within 24 hours]

Site identifier	Date sampled	Tritium (pCi/L)	Tritium QA (pCi/L)	Z-value	Remark
ARBOR Test	10/01/91	0±200	-90±160	0.35	
Area II	7/14/93	70±160	90±160	.09	
Badging Facility	4/19/90	-100±200	0±200	.35	
Big Lost River	10/09/91	140±170	10±170	.54	
Birch Creek	4/05/90	-100±180	-100±200	.00	
Cerro Grande	10/18/90	300±200	300±200	.00	
CFA-2	7/25/91	16,900±500	16,500±500	.57	
CPP 1	11/06/89	120±160	230±160	.49	
	10/31/90	400±200	300±200	.35	
CPP 2	1/31/89	70±160	40±160	.13	
	7/26/89	30±160	20±160	.04	
	4/29/92	0±200	0±200	.00	
CPP 4	7/23/90	130±180	0±200	.48	
CWP-4	4/25/89	-10±150	-30±150	.09	
	4/17/91	50±160	50±160	.00	
CWP-5	10/14/93	0±200	-100±200	.35	
EBR I	4/28/89	-60±150	-60±150	.00	
	4/19/90	0±200	-120±170	.46	
	4/08/93	-70±170	-110±170	.17	
Fire Station 2	4/18/91	50±160	110±160	.27	
	10/08/92	100±200	0±200	.35	
MTR Test	10/07/92	2,900±300	2,900±300	.00	
OMRE	4/28/89	2,700±200	2,600±200	.35	
PW-1	4/24/89	1,500±200	1,600±200	.35	
	10/27/89	4,900±300	4,900±300	.00	
	7/03/90	1,400±200	1,400±200	.00	
PW-2	1/08/91	25,700±700	25,600±700	.10	
	10/25/93	700±200	800±200	.35	
PW-3	3/30/90	20,200±600	19,500±600	.82	
PW-4	2/02/90	2,300±200	2,400±200	.35	
PW-4	10/17/90	5,000±300	5,100±300	.24	
	4/29/91	3,500±300	3,200±300	.71	
	10/22/92	1,700±200	1,500±200	.71	
PW-5	10/17/91	900±200	1,000±200	.35	

Table 46. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Tritium (pCi/L)	Tritium QA (pCi/L)	Z-value	Remark
PW-8	4/05/91	3,600±300	3,400±300	0.47	
	7/17/93	14,600±500	14,100±500	.71	
PW-9	2/04/93	232,000±4,000	229,000±4000	.53	
	4/06/93	237,000±4,000	238,000±4,000	.18	
P&W2	4/18/89	-10±150	-30±150	.09	
	3/14/90	0±200	0±200	.00	
RWMC Prod.	10/30/90	1,700±200	1,700±200	.00	
Site 9	9/27/91	-50±170	100±200	.57	
Site 14	10/18/91	-30±170	-50±170	.08	
	11/04/93	100±200	100±200	.00	
Site 19	10/01/90	100±200	-140±170	.91	
	4/07/92	-200±200	-200±200	.00	
SPERT-1	4/28/89	140±160	-90±150	1.05	
TRA A-77	4/16/90	2,160,000±30,000	2,260,000±30,000	2.36	N
TRA Disp.	1/18/90	6,600±300	6,500±300	.24	
	10/11/90	6,300±300	6,900±300	1.41	
TRA 3	4/27/89	-20±150	70±160	.41	
	4/10/92	0±200	-130±180	.48	
	11/02/92	-100±200	100±200	.71	
TRA 4	11/13/89	10±150	50±160	.18	
	4/25/91	50±160	50±160	.00	
	10/30/91	0±200	-10±170	.04	
	4/05/93	-180±160	0±200	.70	
USGS 1	7/20/92	0±200	-190±170	.72	
USGS 8	4/03/91	90±160	50±160	.18	
USGS 11	10/08/91	110±170	200±200	.34	
USGS 12	6/15/90	## 99.2±25.6	##108.8±25.6	1.06	
USGS 14	10/01/92	-100±200	100±200	.71	
	4/16/93	-60±70	-20±70	.40	
USGS 19	10/12/90	-160±170	-100±200	.23	
	10/01/92	0±200	200±200	.71	
USGS 20	4/08/91	11,300±400	10,700±400	1.06	
USGS 22	4/23/91	120±160	210±170	.39	
	9/30/93	-100±200	140±180	.89	
USGS 23	7/09/93	80±160	-80±160	.71	
USGS 27	4/27/90	0±200	-140±170	.53	
USGS 32	7/06/92	0±200	0±200	.00	
USGS 34	4/01/91	5,100±300	5500±300	.94	

Table 46. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Tritium (pCi/L)	Tritium QA (pCi/L)	Z-value	Remark
USGS 35	10/07/91	7,500±400	7,600±400	0.18	
	4/14/93	6,300±300	6,500±300	.47	
	10/23/93	5,500±400	⊗5,400±400	.18	
USGS 37	1/02/90	27,800±700	27,900±700	.10	
	4/18/90	25,500±700	25,400±700	.10	
	10/21/93	18,200±800	18,500±800	.27	
USGS 38	4/23/92	24,600±700	24,600±700	.00	
	10/14/92	21,300±600	21,100±600	.24	
USGS 40	10/18/89	5,200±300	5,600±300	.94	
	4/25/91	6,600±300	6,900±300	.71	
USGS 43	4/13/90	4,700±300	5,300±300	1.41	
USGS 44	10/26/90	500±200	600±200	.35	
	11/01/93	400±200	500±200	.35	
USGS 45	4/20/92	700±200	800±200	.35	
USGS 46	10/09/91	3,100±300	3,200±300	.24	
USGS 47	4/10/91	6,600±300	7,100±300	1.18	
USGS 52	4/03/90	2,900±300	3,100±300	.47	
USGS 54	7/07/89	4,500±300	4,500±300	.00	
	11/03/89	3,200±200	3,400±200	.71	
	1/14/91	1,400±200	1,700±200	1.06	
	10/16/92	812,000±10,000	822,000±12,000	.64	
	4/19/93	282,000±4,000	292,000±5,000	1.56	
	7/22/93	3,900±300	⊗5,900±300	4.71	N
	10/13/93	4,800±300	4,500±300	.71	
USGS 56	11/15/89	645,000±1,000	643,000±1,000	1.41	
USGS 57	12/22/89	22,500±600	22,800±600	.35	
	6/28/90	24,000±700	24,500±700	.51	
	10/29/90	26,000±700	26,000±700	.00	
	7/21/93	18,500±600	⊗17,900±500	.77	
USGS 58	4/03/91	5,100±300	5,300±300	.47	
	10/21/93	3,900±300	4,100±300	.47	
USGS 59	4/17/89	3,100±200	3,100±200	.00	
	4/28/92	5,200±300	5,100±300	.24	
	4/22/93	8,100±400	8,300±400	.35	
	10/25/93	3,400±300	3,000±300	.94	
USGS 60	10/30/89	110±160	160±160	.22	
	1/10/92	130,000±2,000	133,000±2,000	1.06	
USGS 61	9/27/90	14,700±500	15,200±500	.71	

Table 46. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Tritium (pCi/L)	Tritium QA (pCi/L)	Z-value	Remark
USGS 62	4/09/92	7,200±400	7,700±400	0.88	
	10/13/92	4,800±300	5,000±300	.47	
USGS 63	4/10/90	100±180	130±180	.12	
USGS 65	10/15/91	37,800±900	37,900±900	.08	
USGS 66	4/29/92	6,700±400	7,000±400	.53	
USGS 68	4/27/89	10±150	200±160	.87	
	7/02/91	-50±160	110±170	.69	
	1/17/92	-160±180	-110±180	.20	
USGS 69	10/24/91	20±170	140±170	.50	
USGS 71	4/22/91	13,300±500	1,2600±500	.99	
	10/12/93	7,100±400	7,200±400	.18	
USGS 72	10/28/93	-100±200	-100±200	.00	
USGS 76	1/05/90	2,900±200	2,700±200	.71	
	10/17/90	3,200±300	3,400±300	.47	
	4/26/93	2,700±200	2,800±300	.28	
	10/22/93	2,300±300	⊗2,600±300	.71	
USGS 77	10/09/92	36,800±900	35,800±900	.79	
USGS 82	4/15/92	120±190	-120±180	.92	
	7/07/93	110±160	130±160	.09	
USGS 83	10/11/90	200±200	0±200	.71	
	4/06/92	-100±180	-150±180	.20	
USGS 84	10/09/92	5,700±300	5,600±300	.24	
USGS 85	4/26/90	22,800±600	22,500±600	.35	
	4/19/93	15,000±500	15,600±500	.85	
USGS 86	4/21/89	10±150	-40±150	.24	
	10/13/93	60±80	-60±80	1.06	
USGS 87	4/21/92	1,000±200	1,100±200	.35	
USGS 88	7/12/89	20±160	-10±160	.13	
	7/16/91	-120±160	110±170	.99	
	1/20/93	0±200	0±200	.00	
USGS 89	1/04/89	50±160	-60±160	.49	
	10/16/91	-50±170	0±170	.21	
	1/17/92	-300±200	-100±200	.71	
USGS 90	1/18/89	1,900±200	1,600±200	1.06	
	1/23/90	1,300±200	1,300±200	.00	
	1/16/92	1,500±200	1,400±200	.35	
	4/20/92	1,400±200	1,200±200	.71	
	10/04/93	1,400±200	1,100±200	1.06	

Table 46. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory—continued

Site identifier	Date sampled	Tritium (pCi/L)	Tritium QA (pCi/L)	Z-value	Remark
USGS 100	1/07/91	-100±200	-140±180	0.15	
	10/05/92	-100±200	100±180	.74	
	4/23/93	-150±170	-210±160	.26	
USGS 103	7/16/93	70±160	-60±160	.57	
USGS 104	10/16/89	1,500±200	1,400±200	.35	
	7/09/90	1,800±200	1,700±200	.35	
	1/10/91	1,700±200	1,700±200	.00	
	9/29/92	1,720±110	1,540±100	1.21	
USGS 105	10/25/89	80±70	150±70	.71	
USGS 106	4/02/90	2,200±200	2,100±200	.35	
	4/02/92	2,000±200	1,900±200	.35	
USGS 107	4/22/91	-70±160	10±160	.35	
	4/21/93	-220±160	-60±170	.69	
USGS 109	10/01/93	120±80	120±80	.00	
USGS 110	4/12/89	-60±150	10±150	.33	
	10/11/89	-100±150	0±150	.47	
USGS 111	3/20/90	27,100±700	27,500±700	.40	
USGS 113	7/15/91	30,800±800	30,500±800	.27	
USGS 114	10/05/89	29,000±700	28,800±700	.20	
	9/24/90	30,500±800	30,400±800	.09	
	10/21/91	29,000±700	29,300±800	.28	
USGS 115	7/16/93	4,700±300	4,400±300	.71	
USGS 116	4/06/89	14,100±500	13,700±500	.57	
	10/05/89	11,200±400	11,500±400	.53	
USGS 117	4/18/91	100±160	110±160	.04	
USGS 119	4/03/89	-70±150	-20±150	.24	
	6/28/89	80±160	40±160	.18	
	4/09/90	-200±200	-100±200	.35	
	7/09/92	0±200	0±200	.00	
USGS 120	7/19/90	130±180	140±180	.04	
USGS 122	10/15/91	22,400±600	21,700±600	.82	
	4/15/92	20,400±600	20,600±600	.24	

Table 47. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for americium-241 by the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Remark: the results of replicate pairs are statistically equivalent. Abbreviations: pCi/L, picocurie per liter]

Site identifier	Date sampled	Americium-241 (pCi/L)	Americium-241 QA (pCi/L)	Z-value	Remark
RWMC Prod.	10/30/90	0.06±0.05	0.02±0.03	0.69	
USGS 37	10/21/93	.016±0.018	.00±0.02	.59	
USGS 40	10/18/89	.01±0.12	.04±0.04	.24	
USGS 44	10/26/90	-.04±0.03	-.03±0.03	.24	
USGS 87	4/21/92	.00±0.02	.02±0.03	.55	
USGS 88	7/12/89	.00±0.03	.07±0.03	1.65	
	7/16/91	-.06±0.03	.00±0.02	1.66	
	1/20/93	.05±0.03	.00±0.03	1.18	
USGS 89	1/04/89	.03±0.03	.03±0.03	.00	
	10/16/91	.00±0.02	-.015±0.025	.47	
USGS 90	1/18/89	-.04±0.03	-.04±0.03	.00	
	1/23/90	.00±0.03	.011±0.033	.25	
	1/16/92	.03±0.02	.013±0.022	.57	
	4/20/92	.00±0.02	.02±0.02	.71	
	10/04/93	.00±0.02	.01±0.02	.37	
USGS 117	4/18/91	-.005±0.017	.01±0.03	.44	
USGS 119	4/03/89	.03±0.03	-.01±0.02	1.11	
	4/09/90	.02±0.03	-.01±0.02	.83	
USGS 120	7/19/90	-.014±0.033	.03±0.03	.99	

Table 48. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for plutonium-238 by the Radiological and Environmental Sciences Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Plutonium-238 (pCi/L)	Plutonium-238 QA (pCi/L)	Z-value	Remark
RWMC Prod.	10/30/90	0.03±0.03	0.02±0.02	0.28	
USGS 37	10/21/93	-.001±0.014	.003±0.012	.22	
USGS 40	10/18/89	-.017±0.017	.016±0.017	1.37	
USGS 44	10/26/90	.010±0.019	-.01±0.02	.72	
USGS 87	4/21/92	-.04±0.03	-.011±0.025	.74	
USGS 88	7/12/89	-.016±0.023	-.04±0.02	.79	
	7/16/91	.0±0.03	.03±0.03	.71	
	1/20/93	.016±0.020	.00±0.02	.57	
USGS 89	1/04/89	-.04±0.03	-.013±0.032	.62	
	10/16/91	.01±0.02	-.011±0.017	.80	
USGS 90	1/18/89	-.04±0.03	-.05±0.03	.24	
	1/23/90	.02±0.02	.00±0.02	.71	
	1/16/92	.00±0.02	.00±0.02	.00	
	4/20/92	.00±0.03	-.012±0.025	.31	
	10/04/93	.010±0.015	.003±0.012	.36	
USGS 117	4/18/91	.01±0.02	-.02±0.03	.83	
USGS 119	4/03/89	.10±0.04	-.011±0.023	2.41	N
	4/09/90	-.015±0.014	.015±0.021	1.19	
USGS 120	7/19/90	-.04±0.03	-.015±0.035	.54	

Table 49. Comparison of the results and standard deviations of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for plutonium-239/240 by the Radiological and Environmental Sciences Laboratory

Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: pCi/L, picocurie per liter; N, the analytical results are not in statistical agreement]

Site identifier	Date sampled	Plutonium-239/240 (pCi/L)	Plutonium-239/240 QA (pCi/L)	Z-value	Remark
RWMC Prod.	10/30/90	0.00±0.02	-0.017±0.013	0.71	
USGS 37	10/21/93	-.011±0.011	-.004±0.013	.41	
USGS 40	10/18/89	.005±0.014	-.007±0.017	.54	
USGS 44	10/26/90	-.001±0.011	-.005±0.014	.22	
USGS 87	4/21/92	.011±0.017	.00±0.02	.42	
USGS 88	7/12/89	-.001±0.016	-.001±0.015	.00	
	7/16/91	-.014±0.014	-.025±0.015	.54	
	1/20/93	.006±0.012	.015±0.015	.47	
USGS 89	1/04/89	.00±0.02	-.020±0.016	.78	
	10/16/91	-.004±0.013	-.001±0.01	.18	
USGS 90	1/18/89	-.01±0.02	-.015±0.019	.18	
	1/23/90	-.001±0.015	.015±0.024	.57	
	1/16/92	-.004±0.011	-.009±0.012	.31	
	4/20/92	-.002±0.016	.00±0.02	.08	
	10/04/93	.003±0.015	.000±0.012	.16	
USGS 117	4/18/91	.010±0.023	.016±0.023	.18	
USGS 119	4/03/89	-.08±0.03	.004±0.016	2.47	N
	4/09/90	-.002±0.012	-.009±0.016	.35	
USGS 120	7/19/90	.00±0.02	-.011±0.020	.39	

Table 50. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for total organic carbon by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: mg/L, milligram per liter; N, the analytical results are not in statistical agreement. Symbol: <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Total organic carbon (mg/L)	Total organic carbon QA (mg/L)	Z-value	Remark
NRF-1	9/09/91	0.4	0.4	0.00	
NRF-2	3/21/90	.4	.3	.48	
	3/05/91	.5	.4	.48	
	9/15/93	.5	1.8	6.37	N
NRF-3	6/17/91	1.8	.5	6.37	N
	12/03/92	.7	.7	.00	
NRF-4	2/07/91	.3	.3	.00	
	4/07/93	1.0	.5	2.43	N
NRF-6	3/10/92	.6	.5	.48	
NRF-7	1/08/92	.6	.5	.48	
WSINEL1	12/07/90	1.0	1.6	2.95	N
	12/03/91	.9	.7	.97	
USGS 12	6/15/90	.3	.3	.00	
	09/06/91	.4	.4	.00	
	11/05/93	.4	.6	.97	
USGS 15	8/06/90	1.5	2.2	3.48	N
	3/12/92	<.1	.2	.96	
USGS 17	3/13/91	.1	.4	1.44	
	6/11/93	.1	.5	1.93	
USGS 97	12/07/90	.3	.4	.48	
	6/07/91	.3	.4	.48	
	11/04/93	.4	.5	.48	
USGS 98	7/30/90	.2	.3	.48	
	9/21/92	.5	.5	.00	
USGS 99	10/03/90	.4	.4	.00	
	6/16/92	.3	.4	.48	
USGS 102	12/10/90	.4	.3	.48	
	12/09/92	.4	.4	.00	

Table 51. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for volatile organic compounds by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. For each compound, the result of the routine sample is followed by the result of the quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter. Symbol: <, the result was less than the indicated reporting level. Numbers in bold indicate the results are above their respective reporting limits]

Site identifier	Date sampled	Bromoform (µg/L)	Bromoform QA (µg/L)	Z-value	Remark	Bromodichloromethane (µg/L)	Bromodichloromethane QA (µg/L)	Z-value	Remark	Carbon tetrachloride (µg/L)	Carbon tetrachloride QA (µg/L)	Z-value	Remark
RWMC Prod.	10/30/90	<0.2	<0.2	0		<0.2	<0.2	0		**1.7**	**1.7**	0.00	
USGS 12	6/15/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 44	10/26/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 87	4/21/92	<.2	<.2	0		<.2	<.2	0		**.9**	**.8**	1.28	
USGS 88	7/12/89	<.2	<.2	0		<.2	<.2	0		**1.0**	**1.1**	1.03	
	7/16/91	<.2	<.2	0		<.2	<.2	0		**1.6**	**1.8**	1.28	
	1/20/93	<.2	<.2	0		<.2	<.2	0		**2.4**	**2.3**	.46	
USGS 89	1/04/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	10/16/91	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 90	1/18/89	<.2	<.2	0		<.2	<.2	0		**.9**	**.9**	.00	
	1/23/90	<.2	<.2	0		<.2	<.2	0		**1.0**	**.9**	1.14	
	1/16/92	<.2	**.6**	4.52	N	<.2	**.9**	4.30	N	**1.1**	**1.1**	.00	
	4/20/92	<.2	<.2	0		<.2	<.2	0		**1.2**	**1.3**	.87	
	10/04/93	<.2	<.2	0		<.2	<.2	0		**1.3**	**1.3**	.00	
USGS 117	4/18/91	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 119	4/03/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	4/09/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 120	7/19/90	<.2	<.2	0		<.2	<.2	0		**1.0**	**1.1**	.80	

Table 51. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for volatile organic compounds by the National Water Quality Laboratory—continued

Site identifier	Date sampled	Chloroform (µg/L)	Chloroform QA (µg/L)	Z-value	Remark	Dibromochloromethane (µg/L)	Dibromochloromethane QA (µg/L)	Z-value	Remark	Dichlorodifluoromethane (µg/L)	Dichlorodifluoromethane QA (µg/L)	Z-value	Remark
RWMC Prod.	10/30/90	<0.2	<0.2	0		<0.2	<0.2	0		<0.2	<0.2	0	
USGS 12	6/15/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 44	10/26/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 87	4/21/92	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 88	7/12/89	**.4**	**.4**	.00		<.2	<.2	0		**1.0**	**1.1**	.61	
	7/16/91	**.4**	**.4**	.00		<.2	<.2	0		<.2	<.2	0	
	1/20/93	**.5**	**.6**	1.16		<.2	<.2	0		<.2	<.2	0	
USGS 89	1/04/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	10/16/91	<.2	<.2	0		<.2	<.2	0		**.2**	<.2		U
USGS 90	1/18/89	<.2	<.2	0		<.2	<.2	0		**.2**	**.3**	2.52	N
	1/23/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	1/16/92	<.2	**1.2**	7.47	N	<.2	**.9**	6.90	N	**.4**	**.5**	1.42	
	4/20/92	<.2	<.2	0		<.2	<.2	0		**.3**	**.3**	.00	
	10/04/93	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 117	4/18/91	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 119	4/03/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	4/09/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 120	7/19/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	

Table 51. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for volatile organic compounds by the National Water Quality Laboratory—continued

Site Identifier	Date sampled	Tetrachloroethylene (µg/L)	Tetrachloroethylene QA (µg/L)	Z-value	Remark	1,1,1-Trichloroethane (µg/L)	1,1,1-Trichloroethane QA (µg/L)	Z-value	Remark	Trichloroethylene (µg/L)	Trichloroethylene QA (µg/L)	Z-value	Remark
RWMC Prod.	10/30/90	**0.2**	<0.2		U	**0.4**	**0.4**	0.00		**0.8**	**0.8**	0.00	
USGS 12	6/15/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 44	10/26/90	<.2	<.2	0		**.2**	**.3**	2.31	N	<.2	<.2	0	
USGS 87	4/21/92	<.2	<.2	0		**.2**	<.2	0		**.2**	**.2**	.00	
USGS 88	7/12/89	<.2	**.2**		U	**.2**	**.2**	.00		**.5**	**.6**	.98	
	7/16/91	<.2	<.2	0		**.3**	**.3**	.00		**.8**	**.8**	.00	
	1/20/93	<.2	<.2	0		**.3**	**.3**	.00		**.8**	**1.0**	1.20	
USGS 89	1/04/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	10/16/91	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 90	1/18/89	<.2	<.2	0		**.2**	**.2**	.00		**.4**	**.4**	.00	
	1/23/90	<.2	<.2	0		**.2**	**.2**	.00		**.4**	**.4**	.00	
	1/16/92	<.2	<.2	0		**.2**	**.2**	.00		**.5**	**.4**	1.20	
	4/20/92	<.2	<.2	0		**.2**	**.2**	.00		**.5**	**.5**	.00	
	10/04/93	<.2	<.2	0		**.2**	**.2**	.00		**.4**	**.4**	.00	
USGS 117	4/18/91	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 119	4/03/89	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
	4/09/90	<.2	<.2	0		<.2	<.2	0		<.2	<.2	0	
USGS 120	7/19/90	<.2	<.2	0		**.2**	**.2**	0		**.3**	**.3**	.00	

Table 52. Comparison of results of replicate pairs of samples from the Idaho National Engineering Laboratory analyzed for total phenols by the National Water Quality Laboratory

[Site identifier: see figures 1–3 for location of sites. QA: quality-assurance replicate sample. Z-value: see section on Statistical Comparisons of Replicate Pairs of Samples for explanation. Abbreviations: µg/L, microgram per liter; N, the analytical results are not in statistical agreement; U, statistical agreement of the analytical result is uncertain. Symbol: <, the result was less than the indicated reporting level]

Site identifier	Date sampled	Total phenols (µg/L)	Total phenols QA (µg/L)	Z-value	Remark
NRF-2	3/21/90	<1.0	3.0	5.27	N
NRF-4	2/07/91	4.0	2.0	3.73	N
NRF-6	3/10/92	<1.0	<1.0	0	
NRF-7	1/08/92	1.0	<1.0		U
WSINEL1	10/07/90	2.0	1.0	3.73	N
USGS 12	6/15/90	1.0	2.0	3.73	N
USGS 15	8/06/90	7.0	5.0	1.94	
USGS 97	6/07/90	3.0	3.0	.00	
	12/07/90	2.0	1.0	3.73	N
USGS 98	7/30/90	2.0	1.0	3.73	N
USGS 99	10/03/90	<1.0	<1.0	0	
USGS 102	12/10/90	1.0	<1.0		U

Table 53. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for sodium, chloride, and chromium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviation: mg/L, milligram per liter; µg/L, microgram per liter; IBW, inorganic-free blank water; DW, deionized water. Symbols: #, the analysis was performed by the Radiological and Environmental Sciences Laboratory; <, the result was less than the indicated reporting level; *, the samples were analyzed for the total recoverable constituent, rather than dissolved constituent. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Sodium (mg/L)	Chloride (mg/L)	Chromium (µg/L)	Hexavalent chromium (µg/L)
		Blanks			
USGS 254	2/17/89		#0±2	#0±20	
USGS 288	4/26/89	#0±2	#1±2	#10±20	
USGS 301	6/30/89		#0±2	#0±20	
QA-7	10/31/89	#2±2#	<.1	#10±20	
		<.1		<1	
QAS-1	12/01/89	*<.1	<.1	*2	
QA-1	9/25/90	.4	.8		
QAS-8	11/02/90	*.3	<.1	*1	
QAS-23	6/12/92	**.7**	.8	*<1	
QA-5	5/07/93	<.1	.2	<1	<1
		Equipment blanks (IBW or DW)			
QA-5	7/14/92	.2	<.1	<1	<1
QA-6	8/13/92		.5	3	<1
QA-15	10/22/92	.2	.5	<1	<1
QA-10	4/29/93	<.1	.2	<1	<1
QA-15	4/30/93		.4		
QA-1	7/06/93	<.1	<.1	<1	<1
QA-2	7/06/93	.1	<.1	1	<1
QA-3	7/06/93	<.1	<.1	<1	<1
QA-13	10/13/93	**15**	.3	<1	<1
QAS-30	6/15/93	*<.1	<.1	*<1	
		Equipment Blanks (USGS 17 Rinsate)			
QA-3	04/13/92		8.1	1	<1
QA-3	8/07/92		7.5	2	<1
QA-8	10/16/92	**14**	6	1	<1
QA-4	5/05/93		5.9	1	1
		Equipment Blanks (USGS 97 Rinsate)			
QA-2	7/16/91		40	6	<1
QA-3	10/21/91	15	34	6	2
QA-5	1/21/92		29		
QA-6	1/21/92		17		

Table 54. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for sulfate, fluoride, bromide, and total recoverable mercury by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviation: mg/L, milligram per liter; µg/L, microgram per liter; IBW, inorganic-free blank water. Symbols: <, the result was less than the indicated reporting level. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Sulfate (mg/L)	Fluoride (mg/L)	Bromide (mg/L)	Mercury (µg/L)
		Blanks			
QAS-1	12/01/89	<1.0	<0.1	<0.01	<0.1
QAS-8	11/02/90	<1.0	<.1	<.01	<.1
QAS-23	6/12/92	<.1	<.1	**.07**	<.1
		Equipment blank (IBW)			
QAS-30	6/15/93	.2	<.1	<.01	<.1

Table 55. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for nitrite, as nitrogen; nitrite plus nitrate, as nitrogen; ammonia, as nitrogen; and orthophosphate, as phosphorus, by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviation: mg/L, milligram per liter; IBW, inorganic-free blank water; DW, deionized water. Symbols: <, the result was less than the indicated reporting level. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Nitrite, as nitrogen (mg/L)	Nitrate and nitrite, as nitrogen (mg/L)	Ammonia, as nitrogen (mg/L)	Orthophosphate, as phosphorus (mg/L)
			Blanks		
QA-7	10/31/89	<0.01	<0.10	<0.01	<0.01
QAS-1	12/01/89	<.01	<.10	.03	<.01
QA-1	9/25/90	<.01	<.10	**.10**	<.01
QAS-8	11/02/90	<.01	<.10	.01	<.01
QAS-23	6/12/92	<.01	<.05	<.01	<.01
			Equipment blanks (IBW or DW)		
QA-15	10/22/92	.02	**.09**	**.07**	<.01
QA-1	7/06/93	<.01	<.05	.01	<.01
QA-2	7/06/93	<.01	<.05	.01	<.01
QA-3	7/06/93	<.01	<.05	.02	<.01
QAS-30	6/15/93	<.01	<.03	.02	<.01

Table 56. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for total recoverable trace elements: aluminum (Al), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), nickel (Ni), silver (Ag), and zinc (Zn) by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: µg/L, microgram per liter; IBW, inorganic-free blank water. Symbols: <, the result was less than the indicated reporting level. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Al (µg/L)	As (µg/L)	Ba (µg/L)	Be (µg/L)	Cd (µg/L)	Cu (µg/L)	Fe (µg/L)	Pb (µg/L)	Mn (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)
						Blanks							
QAS-1	12/01/89	**20**	<1	<100	<10	<1	**15**	**80**	3	<10		<1	**10**
QAS-8	11/02/90		<1	<100		<1	1	<10	<1	<10	1	<1	<10
QAS-23	6/12/92							<10	<1		<1	<1	
						Equipment blank (IBW)							
QAS-30	6/15/93							**110**	**17**		<1	<1	

Table 57. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for gross alpha and gross beta radioactivity by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: pCi/L, picocurie per liter; µg/L, microgram per liter; IBW, inorganic-free blank water; Sr-90/Y-90, strontium-90/yttrium-90. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Gross alpha, dissolved, as thorium-230 (pCi/L)	Gross alpha, suspended, as thorium-230 (pCi/L)	Gross alpha, dissolved, as natural uranium (mg/L)	Gross alpha, suspended, as natural uranium (mg/L)
			Blanks		
QAS-1	12/01/89	-0.327±0.183	0.639±0.285	0.643±0.286	-0.334±0.186
QAS-8	11/02/90	-.126±0.160	.057±0.203	.084±0.299	-.236±0.288
QAS-23	6/12/92	.157±0.222	.010±0.179	.231±0.328	.019±0.333
			Equipment blank (IBW)		
QAS-30	6/15/93	-.011±0.007		-.018 ±0.120	

Site identifier	Date sampled	Gross beta, dissolved, as cesium-137 (pCi/L)	Gross beta, suspended, as cesium-137 (pCi/L)	Gross beta, dissolved, as Sr-90/Y-90 (pCi/L)	Gross beta, suspended, as Sr-90/Y-90 (pCi/L)
			Blanks		
QAS-1	12/01/89	**0.779±0.343**	-1.89±0.46	**0.721±0.317**	-1.91±0.46
QAS-8	11/02/90	.260±0.374	-.049±0.488	.249±0.356	-.048±0.475
QAS-23	6/12/92	.196±0.344	.186±0.491	.188±0.329	.181±0.477
			Equipment blank (IBW)		
QAS-30	6/15/93	-.072±0.306		-.070±0.299	

Table 58. Results of blank samples from the Idaho National Engineering Laboratory analyzed for radium-226 and radium-228 by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: pCi/L, picocurie per liter. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Radium-226 (pCi/L)	Radium-228 (pCi/L)
QAS-1	12/01/89	**0.490±0.150**	**2.52±0.56**
QAS-8	11/02/90	**.075±0.016**	.472±0.390

Table 59. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for gamma radiation, strontium-90, and tritium by the National Water Quality Laboratory and the Radiological and Environmental Sciences Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: pCi/L, picocurie per liter; IBW, inorganic-free blank water; DW, deionized water. Symbol: ##, the analysis was performed by the National Water Quality Laboratory. Numbers in bold indicate the analytical results exceed known blank water concentration limits for that analysis]

Site identifier	Date sampled	Gamma radiation (pCi/L)	Strontium-90 (pCi/L)	Tritium (pCi/L)
		Blanks		
USGS 288	4/26/89		-4.5±1.6	**17,000±500**
USGS 301	6/30/89		-1.5±1.4	**2700±200**
QA-7	10/31/89			-50±150
QAS-1	12/01/89			##**185.6±25.6**
QA-1	9/25/90	-20±40	2±2	170±180
QA-5	5/07/93	-20±20	.3±1.6	-200±160
		Equipment blanks (IBW or DW)		
QA-5	7/14/92	40±30	-.8±1.6	200±200
QA-6	8/13/92	-20±20	3±2	120±180
QA-15	10/22/92	30±30	.4±1.5	0±200
QA-10	4/29/93	-15±20	.2±1.5	-60±170
QA-15	4/30/93	-14±17	-.7±1.6	-260±160
QA-1	7/06/93		2.3±1.6	230±170
QA-2	7/06/93		3±2	80±160
QA-3	7/06/93		-.7±1.5	-10±160
QA-13	10/15/93	-15±27	2±2	0±200
		Equipment blanks (USGS 17 Rinsate)		
QA-3	4/13/92	7.0±15	1.0±1.5	-110±180
QA-3	8/07/92		-1.3±1.6	110±180
QA-8	10/16/92		0±2	100±200
QA-4	5/05/93	0±20	.6±1.6	-150±160
		Equipment blanks (USGS 97 Rinsate)		
QA-2	9/16/91	-30±30		150±170
QA-3	10/21/91		0±2	0±200
QA-5	1/21/92		1.1±1.5	-140±180
QA-6	1/21/92		.9±1.5	-160±180

Table 60. Results of blank samples from the Idaho National Engineering Laboratory analyzed for americium-241, plutonium-238, and plutonium-239/240 by the Radiological and Environmental Sciences Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: pCi/L, picocurie per liter]

Site identifier	Date sampled	Americium-241 (pCi/L)	Plutonium-238 (pCi/L)	Plutonium-239/240 (pCi/L)
QA-1	9/25/90	0.015±0.034	0.03±0.02	-0.017±0.014
QA-5	5/07/93	.012±0.020	.017±0.014	.04±0.02

Table 61. Results of blank and equipment blank samples from the Idaho National Engineering Laboratory analyzed for organic constituents which exceeded the reporting level by the National Water Quality Laboratory

[Site identifier: see section on Quality Assurance/Quality Control Samples, Blank Samples for explanation. Abbreviations: mg/L, milligram per liter; µg/L, microgram per liter; DW, deionized water]

Site identifier	Date sampled	Total organic carbon (mg/L)	Methylene chloride (µg/L)	bis(2-ethylhexyl) phthalate (µg/L)	Hexane (µg/L)	Toluene (µg/L)	Total phenols (µg/L)
			Blanks				
QAS-1	12/01/89			28			4
QAS-8	11/02/90	0.5					2
QA-16	11/02/92		1.9				
QA-5	5/07/93		.2			0.3	
			Equipment blank (DW)				
QAB-1	2/21/92		9.0		Present		

Table 62. Upper-tail areas for a normal curve

[The statistical table was compiled by J.W. Stegeman (R.L. Ott, 1993, p. A-3). The level of significance (or p-value) is the area and must be multiplied by two for two-tailed tests]

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.00	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.10	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.20	.4207	.4168	.4129.	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.30	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.40	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.50	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.60	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.70	.2420	.2389	.2258	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.80	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.90	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.00	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.10	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.20	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.30	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.40	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
1.50	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.60	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.70	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.80	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.90	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.00	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.10	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.20	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.30	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.40	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.50	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.60	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.70	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.80	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
2.90	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
3.00	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010

z	Area
3.500	0.00023263
4.000	.00003167
4.500	.00000340
5.000	.00000029

Table 63. Site identifiers and sampling dates for replicate sample pairs collected for analysis of specific types of organic constituents

[Site identifier: see figures 1-3 for location of sites.The analyses of volatile organic constituents included 25 additional compounds for four replicate sample pairs in 1992 and two more additional compounds for two replicate sample pairs in 1993. The analyses of semivolatile organic constituents included three additional compounds for two replicate sample pairs in 1992]

Site identifier	Date sampled	Site identifier	Date sampled
Volatile organic compounds (36)		Semivolatile organic compounds (54), chlorophenoxy-acid herbicides, and organochlorine insecticides with gross PCB's and gross PCN's	
RWMC Prod.	10/30/90	NRF-2	3/21/90
USGS 12	6/15/90	NRF-4	2/07/91
USGS 44	10/26/90	NRF-6	3/10/92
USGS 87	4/21/92	NRF-7	1/08/92
USGS 88	7/12/89	WSINEL1	12/07/90
	7/16/91	USGS 12	6/15/90
	1/20/93	USGS 15	8/06/90
USGS 89	1/04/89	USGS 97	6/07/90
	10/16/91		12/07/90
USGS 90	1/18/89	USGS 98	7/30/90
	1/23/90	USGS 99	10/03/90
	1/16/92	USGS 102	12/10/90
	4/20/92		
	10/04/93		
USGS 117	4/18/91		
USGS 119	4/03/89		
	4/09/90		
USGS 120	7/19/90		
Volatile organic compounds (25) added in 1992		Semivolatile organic compounds (3) added in 1992	
USGS 87	4/21/92	NRF-6	3/10/92
USGS 88	1/20/93	NRF-7	1/08/92
USGS 90	4/20/92		
	10/04/93		
Volatile organic compounds (2) added in 1993		Triazine herbicides, organophosphate and carbamate insecticides, and Aroclors	
USGS 88	1/20/93	USGS 12	6/15/90
USGS 90	10/04/93		

Table 64. Organic compounds and respective reporting levels for the specific types of organic constituents in table 63

[Reporting levels are microgram per liter (Pritt and Jones, 1989; A. C. Watterson and A.T. Kashuba, USGS, written commun., 1993)]

Compound and reporting level		Compound and reporting level		Compound and reporting level	
		Volatile organic compounds (36)			
Benzene	0.2	1,4-Dichlorobenzene	0.2	Methyl bromide	0.2
Bromoform	.2	Dichlorodifluoromethane	.2	Methylene chloride	.2
Carbon tetrachloride	.2	1,2-Dibromoethane	.2	Styrene	.2
Chlorobenzene	.2	1,1-Dichloroethane	.2	1,1,2,2-Tetrachloroethane	.2
Chloroethane	.2	1,2-Dichloroethane	.2	Tetrachloroethylene	.2
Chloromethane	.2	1,1-Dichloroethylene	.2	Toluene	.2
2-Chloroethyl vinyl ether	.2[1]	1,2-trans-Dichloroethylene	.2	1,1,1-Trichloroethane	.2
Chloroform	.2	1,2-Dichloropropane	.2	1,1,2-Trichloroethane	.2
Dibromochloromethane	.2	Cis-1,3-Dichloropropene	.2	Trichloroethylene	.2
Dichlorobromomethane	.2	Trans-1,3-Dichloropropene	.2	Trichlorofluoromethane	.2
1,2-Dichlorobenzene	.2	1,3-Dichloropropene[2]	.2	Vinyl chloride	.2
1,3-Dichlorobenzene	.2	Ethylbenzene	.2	Xylenes, mixed	.2
		Volatile organic compounds (25) added in 1992			
Acrolein	20	Dibromomethane	.2	Naphthalene	.2
Acrylonitrile	20	Cis-1,2-dichloroethylene	.2	N-propylbenzene	.2
Bromobenzene	.2	1,3-Dichloropropane	.2	1,1,1,2-Tetrachloroethane	.2
N-Butylbenzene	.2	2,2-Dichloropropane	.2	1,2,3-Trichlorobenzene	.2
Sec-butylbenzene	.2	1,1-Dichloropropene	.2	1,2,4-Trichlorobenzene	.2
Tert-butylbenzene	.2	Hexachlorobutadiene	.2	1,2,3-Trichloropropane	.2
1,2-Chlorotoluene	.2	Isopropylbenzene	.2	1,2,4-Trimethylbenzene	.2
1,4-Chlorotoluene	.2	P-isopropyltoluene	.2	1,3,5-Trimethylbenzene	.2
Dibromochloropropane	1				
		Volatile organic compounds (2) added in 1993			
Bromochloromethane	.2	Methyltertbutylether	1		
		Semivolatile Organic Compounds (54)			
Acenaphthene	5.0	1,2,5,6-Dibenzanthracene	10.0	Hexachlorocyclopentadiene	5.0
Acenaphthylene	5.0	1,2-Dichlorobenzene	5.0	Hexachloroethane	5.0
Anthracene	5.0	1,3-Dichlorobenzene	5.0	Indeno (1,2,3-cd) pyrene	10.0
Benzo (a) anthracene	10.0	1,4-Dichlorobenzene	5.0	Isophorone	5.0
Benzo (b) fluoranthene	10.0	2,4-Dichlorophenol	5.0	2-Methyl-4,6-dinitrophenol	30.0
Benzo (k) fluoranthene	10.0	Diethyl phthalate	5.0	Naphthalene	5.0
Benzo (g,h,i) perylene	10.0	Dimethyl phthalate	5.0	Nitrobenzene	5.0

Table 64. Organic compounds and respective reporting levels for the specific types of organic constituents in table 63—continued

Compound and reporting level		Compound and reporting level		Compound and reporting level	
Benzo (a) pyrene	10.0	2,4-Dimethylphenol	5.0	2-Nitrophenol	5.0
4-Bromophenyl phenyl ether	5.0	Di-n-butyl phthalate	5.0	4-Nitrophenol	30.0
Butyl benzyl phthalate	5.0	2,4-Dinitrophenol	20	n-Nitrosodimethylamine	5.0
bis (2-Chloroethoxy) methane	5.0	2,4-Dinitrotoluene	5.0	n-Nitrosodi-n-propylamine	5.0
bis (2-Chloroethyl) ether	5.0	2,6-Dinitrotoluene	5.0	n-Nitrosodiphenylamine	5.0
bis (2-Chloroisopropyl) ether	5.0	Di-n-octyl phthalate	10.0	Pentachlorophenol	30.0
4-Chloro-3-methylphenol	30.0	Bis (2-ethylhexyl)phthalate	5.0	Phenanthrene	5.0
2-Chloronaphthalene	5.0	Fluoranthene	5.0	Phenol	5.0
2-Chlorophenol	5.0	Fluorene	5.0	Pyrene	5.0
4-Chlorophenyl phenyl ether	5.0	Hexachlorobenzene	5.0	1,2,4-Trichlorobenzene	5.0
Chrysene	10.0	Hexachlorobutadiene	5.0	2,4,6-Trichlorophenol	20.0
		Semivolatile organic compounds (3) added in 1992			
Benzidine	40	3,3'-Dichlorobenzidine	20	1,2-Diphenylhydrazine	
		Chlorophenoxy-acid herbicides			
2,4-D	.01	Silvex	.01	2,4,5-T	.01
2,4-DP	.01				
		Organochlorine insecticides			
Aldrin	.01	Dieldrin	.01	Lindane	.01
Chlordane	.1	Endosulfan	.01	Methoxychlor	.01
DDD	.01	Endrin	.01	Mirex	.01
DDE	.01	Heptachlor	.01	Perthane	.1
DDT	.01	Heptachlor epoxide	.01	Toxaphene	1.0
		Gross polychlorinated compounds			
Gross polychlorinated biphenyls (PCB)	.1	Gross polychlorinated naphthalenes (PCN)	.1		
		Triazine herbicides			
Alachlor	.1	Metolachor	.1	Propazine	.1
Ametryn	.1	Metribuzin	.1	Simazine	.1
Atrazine	.1	Prometon	.1	Simetryn	.1
Cyanazine	.1	Prometryn	.1	Trifluralin	.1
		Organophosphate insecticides			
Diazinon	.01	Methyl parathion	.01	Phosphorotrithioate, S,S,S-Tributyl-(DEF)	.01
Disulfoton (Di-syston)	.01	Methyl trithion	.01		
Ethion	.01	Parathion	.01	Trithion	.01
Malathion	.01	Phorate	.01		

Table 64. Organic compounds and respective reporting levels for the specific types of organic constituents in table 63—continued

Compound and reporting level		Compound and reporting level		Compound and reporting level	
		Carbamate insecticides			
Aldicarb	0.5	Carbofuran	0.5	1-Naphthol	0.5
Aldicarb sufone	.5	3-Hydroxycarbofuran	.5	Oxamyl	.5
Aldicarb sulfoxide	.5	Methomyl	.5	Propham	.5
Carbaryl (Sevin)	.5				
		Aroclors (polychlorinated biphenyls)			
Aroclor 1016	.1	Aroclor 1242	.1	Aroclor 1254	.1
Aroclor 1221	.1	Aroclor 1248	.1	Aroclor 1260	.1
Aroclor 1232	.1				

[1]In 1993, the reporting level of 2-chloroethyl vinyl ether increased from 0.2 microgram per liter to 1 microgram per liter.
[2]In 1992, analyses of volatile organic compounds did not include 1,3-dichloropropene.